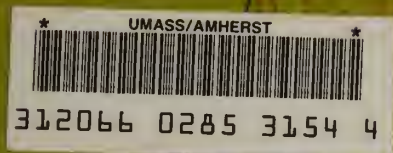


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DRAFT AREAWIDE WASTE TREATMENT MANAGEMENT PLAN Part 2 for the Metropolitan Boston Area



Submitted in fulfillment of
Section 208 of the Federal
Water Pollution Control Act
Ammendments of 1972

Metropolitan Area Planning Council



DRAFT AREAWIDE
WASTE TREATMENT
MANAGEMENT PLAN PART 2
FOR THE METROPOLITAN BOSTON AREA

METROPOLITAN AREA PLANNING COUNCIL
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March 1978



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TABLE OF CONTENTS

PART II DRAFT AREAWIDE WASTE TREATMENT MANAGEMENT PLAN

<u>Introduction</u>	i
<u>Section 1 Implementation of the Areawide Plan</u>	
I. Management and Planning	1-1
A. The Legal and Institutional Requirements	1-1
<u>Section 2 Wastewater Management</u>	
I. Wastewater Treatment	2-1
A. Treatment Concepts	2-2
B. Identification of Wastewater Management Agencies	2-15
II. Cost Estimation for Wastewater Treatment	2-18
A. Wastewater Treatment Facilities	2-18
B. Septage Treatment Facilities	2-30
III. Treatment Concepts and Cost Analysis (with 92 community charts)	2-34
<u>Section 3 Industrial Discharges</u>	
I. The Study Scope	3-1
II. Study Findings	3-3
III. Recommendations	3-5
IV. Determination of Significant Industries	3-7
A. Introduction	3-7
B. Data Base Development	3-7
C. Significant Industries	3-10
D. Further Evaluation	3-31
E. Updating and Use of the Data Base	3-45
V. Recommended Sewer Use Ordinances	3-50
A. General	3-50
B. Method of Approach	3-50
C. Model Sewer Use Law	3-50
D. Need for a Sewer Use Law	3-51
E. Organization and General Contents of Model Sewer Use Laws	3-52
F. Review of Local Ordinances	3-53
G. Toxic Pollutants	3-55
H. Drain Layer's Manual	3-57
VI. Pretreatment Guidelines for the Tanning Industry	3-57
A. General	3-57
B. Sources of Wastewater Discharges	3-60
C. Significant Pollutants in Tanning Industry Discharges	3-60
D. Current Federal Guidelines	3-61
E. Existing Situations	3-62
F. Pretreatment Guidelines	3-65

TABLE OF CONTENTS (cont.)

VII.	Financial and Management Factors	3-66
	A. Enforcement Strategies	3-66
	B. Incentives for Voluntary Compliance	3-67
	C. A Role for the 208 Management System	3-70
	Attachment - Proposed Model Sewer Use Law	3-73
	Attachment - Sample Drain Layer's Manual	3-86
	Attachment - SIC Code Description	3-95
 <u>Section 4 Stormwater Management</u>		
I.	Stormwater Runoff in the Boston Metropolitan Area	4-1
	A. Purpose and Scope	4-1
	B. Problem Statement	4-1
	C. Study Approach	4-3
II.	Alternative Solutions to Stormwater and Combined Sewer Discharges	4-5
	A. Introduction	4-5
	B. Control Alternatives - A General Discussion	4-5
	C. Non-Structural Control Alternatives - "Best Management Practices"	4-6
	D. Structural Control Alternatives	4-16
III.	Management Agencies for Stormwater	4-41
 <u>Section 5 Non-Point Source Pollution</u>		
I.	Land Development Controls	5-2
	A. Wetlands Zoning District	5-4
	B. Floodplain Zoning District	5-4
	C. Aquifer Protection District	5-5
	D. Watershed Zoning District or Buffers	5-6
	E. Water Resource Protection District	5-6
	F. Grading and Slope Regulations	5-7
	G. Minimum Open Space Requirements	5-7
	H. Parking Area Regulations	5-8
	I. Land Use and Density Regulations	5-8
	J. Cluster and PUD Regulations	5-8
	K. Site Plan Review	5-9
	L. Subdivision Control	5-11
	M. Performance Standards	5-12
	N. Growth Management	5-14
	O. Transfer of Development Rights	5-16
	P. Acquisition of Land	5-17
	Q. Conservation Districts	5-18
	R. Wetlands Protection	5-18
II.	Water Conservation	
	A. The Benefits	5-19
	B. A Sample Conservation Program	5-20
	C. Additional Techniques	5-22
III.	On-Site Sewage Disposal	
	A. Operation and Location	5-23
	B. Regulations	5-25
	C. Sample Inspection/Maintenance Programs	5-29

TABLE OF CONTENTS (cont.)

IV. Landfills	
A. Siting	5-33
B. Operation	5-34
C. Monitoring	5-36
D. Regional Options for the Future	5-37

V. Road De-Icing Salt	
A. The Problem	5-39
B. New State Regulations	5-39
C. A Local Salt Control Program	5-41

Attachment - A list of available maps produced by the MAPC 208 program.	5-42
--	------

Attachment - A list of sample and model ordinances, by-laws and other regulations	5-43
--	------

Section 6 208 Management Agencies

I. The Existing Agencies	6-2
A. Municipal Government	6-2
1. Planning Boards/Boards of Survey	6-3
2. Building Inspector	6-4
3. Boards of Zoning Appeal	6-4
4. Boards of Health	6-5
5. Conservation Commissions	6-6
6. Public Works Agencies	6-7
7. Harbor Master	6-8
8. Water Departments	6-8
9. Sewer Departments	6-8
10. Industrial Development Financing Authority	6-9
B. Regional Government	
1. Metropolitan Area Planning Council	6-10
2. South Essex Sewerage District	6-11
3. Charles River Pollution Control District	6-13
4. Other Wastewater Management Options	6-13
5. Ipswich River Watershed District	6-15
6. Regional Boards of Health	6-15
7. Conservation Districts	6-18
C. State Government	
1. Executive Office of Environmental Affairs	6-19
2. Department of Environmental Quality Engineering	6-25
3. Division of Water Pollution Control	6-28
4. Metropolitan District Commission	6-29
5. Department of Environmental Management	6-32
D. Federal Government	
1. Environmental Protection Agency	6-34
2. Corps of Engineers - Department of the Army	6-41
3. Soil Conservation Service - Department of Agriculture	6-42
4. Department of Housing and Urban Develop- ment	6-43

TABLE OF CONTENTS (cont.)

Attachment - list of MAPC 208 Papers Available
for Review

PART I

Part I, a separate volume of this draft Areawide Plan, contains:

1. Areawide Implementation Recommendations for:
 - Regional Agencies
 - State Agencies
 - Federal Agencies
2. Recommendations for action by each of the 92 cities and towns.

THE NATIONAL GOAL

With the passage of the Federal Water Pollution Control Act Amendments of 1972, Congress committed the nation to the most significant environmental program in its history.

"The objective of the Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters, in order to achieve this objective it is hereby declared that...

...it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985;

it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983..."

To help achieve the goals, the Act was funded initially at \$16 billion over five years to support the construction of municipal wastewater treatment facilities. And an additional \$24.5 billion for the next five years was authorized in the amendments of 1977. The Act also established the National Pollutant Discharge Elimination System (NPDES) which required municipal and industrial polluters to obtain a permit to discharge wastes to the nation's waters. The permits, issued by the states and the U.S. Environmental Protection Agency, set conditions and schedules for eliminating pollution discharges. And the Act requires the recipients to pay for wastewater treatment services through user charges and industrial cost recovery.

But in section 208, Congress took its most innovative and forward-looking step. Section 208 established areawide water quality planning programs across the nation. Section 208 planning is unique in many ways:

- . The 208 plans must deal with the well recognized point sources of pollution (those that come from a pipe) and with non-point sources (pollution from diffuse causes such as failing septic systems, leachate from landfills, stormwater runoff from streets, etc.)
- . The plans must deal with means of preventing pollution as well as means of clearing it up;
- . The plans must be areawide in scope and deal with problems that cross municipal borders ;
- . The plans must be written with full citizen participation and make use of the public's wishes to the greatest extent possible; and
- . The plans must identify the means of their implementation and establish an areawide management system to update and carry out plan recommendations through 1995.

THE MAPC

The task of preparing an Areawide Water Quality Plan for Metropolitan Boston was assigned to the Metropolitan Area Planning Council (MAPC) by Governor Michael S. Dukakis in 1975. The MAPC is Greater Boston's officially designated regional planning agency. Its membership consists of 101 cities and towns, 11 state agencies and 21 gubernatorial appointees. The Council is the representative agency for the major general purpose local governments within the metropolitan area for intergovernmental cooperation and comprehensive planning.

The MAPC's Water Quality Project is now engaged in a 208 planning program for one of the largest and most diverse planning areas in the nation. It involves 92 of the MAPC's 101 cities and towns and nine separate river basins. A population of nearly three million people will be effected by the results. The \$2.3 million cost is fully funded by a grant from the U.S. Environmental Protection Agency.

The communities of this 208 area have, as required by EPA regulations, indicated their intent, "through formally adopted resolution, to join together in the planning process to develop and implement a plan which will result in a coordinated waste treatment management system for the area...."

The quotation above is from the sample resolution of intent adopted by the participating local governments. The resolution cited some of the reasons for the Council's designation:

"...(to) insure the integration of waste treatment management planning into the overall comprehensive development planning process for the Boston Metropolitan area; and,

...(to) equip the Council's participating governments with a significant new tool to guide and control development and growth..."

The resolution also noted a significant step taken by the Congress to insure that the 208 Areawide Plan would be implemented:

"...all proposals for grants for construction of public owned treatment works within the boundaries of the designated area will be consistent with the approved plan and will be made only by the designated management agency."

In addition to the resolutions of intent by local governments, the MAPC signed a memorandum of understanding with the area's largest existing wastewater management agency, the Metropolitan District Commission (MDC) which operates the Metropolitan Sewerage District serving 43 cities and towns in the 208 area. The memorandum defined the relationship of the two agencies in the 208 study, including establishment of a technical subcommittee and a consultant selection committee. It attempted to avoid unnecessary duplication of the MDC's Eastern Massachusetts Metropolitan Area (EMMA) study by agreeing that maximum possible use would be made of EMMA plans, materials and engineering recommendations. It also called for 208 incorporation of the conclusive recommendations of the

EMMA study, including the recommended construction program "unless additional data developed during the 208 study prompts a need for reconsideration and possible modification of those recommendations." The memorandum concluded: "The MAPC and MDC shall jointly recommend the final 208 plan to the Governor."

THE AREAWIDE PLAN

The major product of the MAPC Water Quality Project is the 208 Areawide Plan. It is the Areawide Plan which, when certified by the Governor and the U.S. Environmental Protection Agency, will determine the expenditure of millions of dollars in federal and state water pollution control funds. It is the Areawide Plan which must be implemented by governments at the federal, state, regional and local levels.

The Areawide Plan is the culmination of more than two years of work by MAPC 208 staff and private consultants. The plan presents the conclusions developed in several preliminary reports with a functional and basinwide focus. These conclusions have been arrived at with the advice and criticism of citizens and local officials who participated in an extensive public involvement process described below.

The Areawide Plan differs significantly from the nine Preliminary River Basin Reports which have been published and reviewed in recent months for the North/South, Weymouth, Ipswich, North Coastal, Upper Charles, Lower Charles, SuAsCo (Sudbury, Assabet, Concord), Neponset and Mystic River Basins. The intent of the basin reports and their accompanying handbooks was to present a set of technically feasible alternatives to solve and prevent water quality problems. The basin reports also identified the likely impacts and costs from each of the alternatives in terms of direction, magnitude, duration and significance. The impact categories assessed were:

Legal and Institutional Implications

- legislative
- institutional

Water Quality and Supply Impacts

- ground water

Environmental Impacts

- erosion
- flood control
- drainage
- recharge
- wildlife
- air quality

Social Impacts

- housing
- recreation and open space
- archeological and historical
- aesthetic

Economic/Employment Impacts

- water quality related employment
- manufacturing
- construction
- agriculture

Governmental Impacts

- taxes and assessed valuation
- induced costs or municipal service requirements

Land Use Impacts

- population
- residential land use
- commercial land use
- industrial land use
- transportation

For purposes of comparison, the alternatives were assessed against a "de facto projection", that is a projection of current trends with no action to improve and preserve water quality beyond those already planned.

Some 4500 copies of the basin reports and their handbooks have been distributed to citizens, local officials, city/town halls and main libraries. All of the comments, corrections and opinions expressed in response to the preliminary basin reports have been carefully considered in the preparation of the addenda to the basin reports and in the drafting of conclusions in this draft Areawide Plan.

In addition to the basin reports, the results of staff analysis and public comment on the 208 stormwater, septage, industrial and management reports also were used in the development of recommendations in this plan.

PLAN FORMAT AND USE

To fully understand and use the Areawide Plan, it is important to be aware of several factors regarding the plan's data base, map scale and format.

- * The data used in the Areawide Plan is the latest available to the MAPC. The population figures and projections, land use zoning, regulation and other information were reviewed and verified with citizens and officials of the participating communities in 1976 and again, in 1977, through review of the preliminary basin reports. All errors or changes which would influence a conclusion in the Areawide Plan were considered prior to the preparation of the plan. If any errors remain or if significant changes have occurred, such as a major zoning revision, please contact the Water Quality Project as soon as possible.

- * Note that the Areawide Plan is for a 20 year period. Some of the solutions recommended are needed now, while others are recommended to meet future needs assuming a given level of population growth and/or pattern of land development. The plan will be updated annually and changes in the rate or location of growth or the development of new technology can become a basis for further revision of the recommendations. Actions taken by communities to regulate development which is inconsistent with the environmental capability of the land, may avoid a 208 recommendation of expensive sewerage at some future time.

- * The Metropolitan District Commission's (MDC) EMMA study was scheduled to have been finalized prior to the writing of the Areawide Plan. The study includes an extensive construction program for the upgrading and expansion of the Metropolitan Sewerage District (MSD) which serves 43 cities and towns in Greater Boston. The initial study has been completed and the 208 staff has had access to its conclusions and much of its supporting material. However, the final decisions on the EMMA study are still in doubt pending completion of an Environmental Impact Statement by the U.S. Environmental Protection Agency. That EIS, which was also scheduled for completion prior to the writing of the draft Areawide Plan, is not yet complete. If it is completed prior to the end of the review period for the draft Areawide Plan, its conclusions will be

reviewed and considered for inclusion as appropriate in the final Areawide Plan.

- The maps which are included with this Areawide Plan are intended as approximations of the alternative solutions considered by the Water Quality Project. They are not the official project maps and no attempt has been made to include at that map scale (1":8000') all of the information or even all of the water bodies, considered in the plan. The project's official maps (1":3000') are available for review at the MAPC offices. Even these maps are not immediately applicable for implementation of many of the solutions recommended in the plan, such as the adoption of a new or revised zoning by-law. An intermediate step of application of plan information to a scale appropriate to town level planning may be required. The Water Quality Project has applied to the U.S. Environmental Protection Agency for funds to provide technical assistance to communities to encourage and facilitate the implementation of the plan's recommended solutions.

- A recommendation in the 208 Areawide Plan for construction or expansion of sewers or other sewage treatment facilities does not eliminate the need for a Section 201 study on the local level. It is this 201 study, conducted by an engineering consultant hired by the town and paid entirely with federal funds, that finally determines the size, type, location, timing and cost of any facilities to be built. The 1977 amendments to the Federal Water Pollution Control Act have somewhat changed the eligibility for the newly appropriated federal funds. A discussion of the changes appears in Part 2 section 6 of this draft Areawide Plan.

- The identification of a management agency, especially at the local level, does not mean that the agency should carry out the recommendations of the 208 plan alone and without consultation and cooperation with other bodies. The identified agency is the agency with the authority to implement a given recommendation, but the nature of the recommendation may require a cooperative approach with other boards, departments and committees in that community and/or with the agency's counterpart in neighboring communities. A joint evaluation of the 208 recommendations by each community to determine points of needed coordination among the several local agencies is essential. The chief elected official should see that this evaluation takes place and that a comprehensive approach results.

PUBLIC PARTICIPATION AND LOCAL OFFICIAL INVOLVEMENT

The MAPC 208 public participation program summarized in the following pages was founded on the realization that the implementation of the 208 Areawide Plan depended on its acceptance by affected units of government, and of the acceptability of this plan to the general public and their local officials because of their continued involvement with and input into the project.

An active public participation program sought out every vehicle feasible for providing information to all who would or could provide input to the project as well as to those who would be affected by it. Activities include (but were not restricted to):

- news releases and newsletters
- data depositories (libraries)
- copying facilities
- exhibits (libraries, river revels, Ccusteau day, etc.)
- speeches and TV appearances by 208 staff
- workshops and seminars
- task force on public participation
- staff assistance to advisory committees
- development of mailing lists and recruitment of interested readers in 92 communities
- public meetings and hearings (by 208 staff and consultants)
- consideration of citizen views and use of information provided
- 2-3 full time public participation staff members throughout project duration
- public notice of all reports and meetings
- publication and distribution of some 4500 preliminary reports plus superseding addenda and the Draft Areawide Plan
- Advisory Committees (TSC, CAC, APAC, PPTF)
- Watershed Association contracts

MAPC has worked continuously to provide clearly defined channels through which interested citizens could communicate with 208 staff to develop a comprehensive public participation program with defined responsibilities for actively carrying out this program; to provide adequate funding (approximately \$294,000 to Jan. '78.) to insure active public participation throughout each phase of the planning process and to be responsive to all interested citizens, but not dominated by any single person or interest group.

Throughout the nine basins into which the 92 communities were divided, three series of citizen and local officials workshops were held early in the project which provided opportunity for the 92 project communities to input town data to MAPC staff directly. Some 150 meetings were held subsequently to gather additional technical data by MAPC consultants in the SuAsCo & Upper Charles Basins for example.

Local officials in most of the 92 communities contributed advice and later verified data used by staff to develop nine preliminary basin reports, the septage management report and the management alternatives report. All local officials and interested citizens were urged to read and respond to the preliminary reports. Some 4500 basin reports were distributed throughout the nine basins to elected officials and each town board and to recruited and volunteer readers in each of the 92 cities and towns. To date, only about half a dozen towns (of 92) have not responded to these reports.

Approximately 800 interested citizens and local officials attended public meetings held in each basin. Comments, questions, new and corrected data from the basin meetings were incorporated into addenda to the preliminary basin reports. The addenda and basin reports were submitted, as "second drafts" for formal state review to the DEQE for their recommendations and simultaneously to the Executive Director/Executive Committee for their reviews. Copies of the addenda were also provided to involved citizens, local officials, and the 208 advisory committees. It is those addenda which superceeded the preliminary reports which the staff used to develop this draft Areawide Plan.

ADVISORY COMMITTEES

Pursuant to Section 208 (a)2, grant regulations for Section 208 (40 CFR 35, subpart F) made provision for including representatives of the state and the general public on an Areawide Planning Advisory Committee (APAC). The MAPC established APAC early in the project as a policy advisory committee to advise MAPC during the development of the Areawide Plan on broad policy matters, including the fiscal, economic, and social impacts of the plan. APAC has met with staff at the 208 offices on an approximately monthly basis throughout the project and has reviewed and provided comment on each 208 document produced. Membership includes representatives from U.S. EPA-Region I, the state (DEQE), local elected officials, representatives from environmental interest groups, the Citizens' Advisory Committee, and interested citizens.

A Technical Advisory Committee (TSC) was established at the beginning of the project which assumed responsibility for formal action upon a plan of study including work elements, agency task assignments, consultant assignments, and 208 fund allocations to elements in accordance with EPA guidelines. The approval and advice of the technical subcommittee was sought during the execution of the plan of study and will be sought in the final plan selection. Representatives include members from the EPA, state (DEQE) and MDC. The TSC has met approximately monthly throughout the 208 project.

MAPC also established early in the project a Citizens Advisory Committee (CAC) composed of interested citizens and special interest groups who review and comment on technical and management staff reports, the comments of citizens on the planning process, and the public participation efforts. The CAC meets bi-monthly and has made a large contribution in its careful review of and commentary on the preliminary basin reports.

MAPC established a Public Participation Task Force (PPTF) in the earliest phase of the project. The task force early on worked diligently with 208 staff on issues such as: identification of water quality problems and priorities for resolving these problems; relative importance of water quality goals in relation to other community goals, the role that water quality management could or should play in achieving community goals; the use of land use controls and a regional approach to waste treatment to protect water quality; the use of land disposal and other innovative or controversial pollution control technologies.

To maximize the base of already environmentally aware citizens, the MAPC entered into contracts with the five existing watershed associations within the 208 area. Some \$69,000 has been used to date for broader public participation activities through use of services of:

- Charles River Watershed Association
- Neponset Conservation Association
- Mystic River Watershed Association
- North and South Rivers Watershed Association
- SuAsCo Watershed Association

Additionally, through the year long efforts of a full time 208 staff public participation person, the Ipswich River Watershed Association was strengthened and exists today independently of MAPC. Approximately 20 APAC, 20 TSC, 40 CAC, 20 PPTF meetings have been held to date. About 60 informal meetings have been held between staff members and interested association representatives. We are confident that the MAPC public participation program has fully complied with and surpassed all requirements for public participation for this project. The level and quality of this participation has greatly influenced the plan's conclusions. The legal requirements of the Act are summarized below.

LEGAL REQUIREMENTS

Section 101(e) of the Act states:

"Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan or program established by the Administrator (of EPA) or any State under this Act shall be provided for, encouraged, and assisted by the Administrator and the States."

The Environmental Protection Agency has published regulations specifying guidelines for public participation in water pollution control efforts. These regulations (40 CFR 105) require efforts such as:

- provide technical information at the earliest practicable times and at places easily accessible to interested or affected persons and organizations;
- have standing arrangements for early consultation and the exchange of views with interested or affected persons and organizations on development or revision of plans, programs or other significant actions prior to decision making;
- maintain a current list of interested persons and organizations to be notified, when appropriate;
- develop procedures to insure that information concerning water programs, when submitted by citizens, will receive proper attention;
- provide full and open information on legal proceedings under the Act;
- provide opportunities for public hearings on proposed regulations and whenever there is sufficient public interest in a matter.

CERTIFICATION/PLAN APPROVAL PROCESS

This draft Areawide Plan was developed from public review and comment on nine preliminary basin reports, their addenda, the Areawide Septage Treatment Management Plan, and the Areawide Water Quality Management Alternatives Report. The areawide waste treatment management plan alternatives were reviewed in their preliminary stages and it is herein assumed that each of the surviving alternatives presented, if implemented, would meet all regulatory requirements and comply with the appropriate goals and objectives within specified limits of technical reliability. The MAPC is responsible for conducting public meetings on this draft plan and for making modifications to the Areawide Plan based upon that review.

MAPC is required to provide the governing bodies of local governments having responsibility for, or which would be directly affected by, implementation of the plan and having jurisdiction in the planning area, an opportunity to comment on the Areawide Plan and proposed management agency (ies) and make recommendations for approval or disapproval. In the event that a local unit of government fails to respond within 30 days of receiving the request, MAPC may consider that the plan has been favorably recommended by that unit of local government. The Final 208 Plan Review Questionnaire (from DEQE) will be distributed with the Areawide Plan to the Chief Elected Official of each municipality for his/her response.

All local comment, whether favorable or unfavorable, will be forwarded to the Governor. The local comments are also to be forwarded to the EPA Region I Administrator when the plan is submitted to EPA by the state.

STATE

Subsequent to the initial 60 day public review, the staff is responsible for responding to recommendations/deficiencies on the draft plan. The state lead reviewing agency (DEQE) and other relevant state agencies will then review the plan prior to the necessary certification of approval by the Governor. The purpose of the state's review is to determine whether:

- 1) the plan is in compliance with the provisions of the state program prepared under Section 106 of the Act and will then be accepted as a detailed portion of the state plan when approved by EPA;
- 2) implementation of the plan will enable meeting the 1983 goals of the Act;
- 3) the plan is in conformance with Sections 201, 208, and 303 of the Act;
- 4) the plan is in conformance with other applicable regulations.

DEQE will send the Areawide Plan to the Chief Elected Officials for a 30 day review and response period of the cities and towns. A DEQE questionnaire to help focus the responses will be included. Based on the state's review of the plan and the responses received from local governments, the Governor must then determine whether to approve or disapprove the plan. Local governments which disapprove certain elements of the plan must stipulate why they disapprove and what they want to see changed.

If the Governor approves the plan, he must then forward it to the EPA Region I Administrator with his certification of approval and proposed designation of management agency(ies). The Governor must also forward the recommendations received from the local governments. If no certification of approval can be issued by the Governor due to failure of the plan to meet one or more of the above provisions, the Governor must notify the EPA Region I Administrator and the MAPC that the plan is deficient and specify how the plan is to be modified so that it may receive state certification of approval.

The state (DEQE) will be utilizing an element-by-element certification process to evaluate those recommended 208 elements to be included in the state-wide plan. The Governor may certify some elements of the Areawide Plan and withhold verification of others until state-wide plan modifications are made. Examples of questions to be asked of state agencies and the Chief Elected Official in each town in their "Final 208 Plan Review Questionnaire" include:

Non-Point Sources: Subsurface Sewage Disposal

Do you believe the assessment of pollution from subsurface sewage disposal systems (septic tanks) is adequate?

Yes _____ No _____

If no, please elaborate.

Do you concur with the recommended solutions?

Yes _____ No _____

If no, please elaborate:

Will you support and work toward the implementation of the recommendations contained within this element?

Yes _____ No _____

Environmental, Social, Economic Impact Assessment

Do you feel the Environmental Impact Assessment adequately evaluates the:

	YES	NO
Plan Implementation Schedule?	_____	_____
Effectiveness of the Plan in meeting water quality goals?	_____	_____
Direct costs of the Plan?	_____	_____
Indirect Costs (social, environmental, secondary economic impacts, etc)?	_____	_____
Are there any other impacts which should have been considered? Please elaborate.	_____	_____

All certified elements from the separate 208 planning programs in Massachusetts will form the statewide approach to that element and will be the basis for a statewide determination of priorities. The certified 208 plan elements will be incorporated as part of the Statewide Water Quality Management Plan and will also be used to evaluate the consistency of other statewide programs with the 208 program.

FEDERAL

The EQP Region I Administrator will be responsible for plan approval.

Approval of the plan will be based upon: (1) the state's certification of approval and proposed designation of management agency(ies); and (2) EPA's review of the plan submission to determine that it fulfills the four previously listed (state) requirements. State and local comments and recommendations will also be considered. EPA will not approve any plan in the absence of proposed designation of management agency(ies).

Within 120 days after receiving the plan submittal, the Region I Administrator must:

- 1) notify the state and the MAPC of approval of the plan and the proposed management agency(ies) designation; or
- 2) notify the state and the MAPC that the submittal is deficient in one or more aspects and specify the ways in which the submittal must be modified to receive EPA approval. EPA must also specify the time period allowed for the modifications; or
- 3) notify the state and MAPC that the designation of waste treatment management agency(ies) cannot be approved due to failure to meet the requirements set forth in Section 208 (c) (2) of the Act, thereby delaying further consideration of the plan until the deficiencies are remedied. EPA must also specify the time period allowed for correcting the deficiencies.

ANNUAL CERTIFICATION OF CONSISTENCY

After the plan has been approved, it must be certified annually by the Governor or his designee (DEQE) as being consistent with applicable basin plans. The management agency(ies) should initiate the annual certification process. After receiving certification, the plan must be submitted to the Region I Administrator for approval. If the governor fails to certify, notification should be given to the EPA Region I Administrator and the management agency(ies) explaining modifications necessary to receive certification.

COMMUNITY ROLES

You are urged to participate further in the development of the Areawide Plan by reading and commenting on this draft document. MAPC encourages each of you to participate in the public hearings to be held on this draft approximately two months from now at that location most convenient to you. We request that you forward a copy of your comments to be made at the public hearing to your chief local official for his or her consideration as well as to the MAPC staff.

EIS

This document is both a draft Areawide Plan and a draft Environmental Impact Statement. The MAPC 208 staff assessed a full range of natural, economic, social, institutional, developmental and other impacts of the alternatives presented in its nine preliminary basin reports. The recommended solutions in this draft Areawide Plan were reached after careful consideration and public review of these alternatives and their likely impacts. The recommended solutions in this document were themselves evaluated in the same impact categories and the results were broken out to show the likely impacts at the individual community level. The evaluation process and the process of public review of this document were designed to be consistent with both the 208 review and certification requirements and the requirements of the National Environmental Policy Act (NEPA).

Section 2.1

Implementation



PART II, SECTION 1 IMPLEMENTATION OF THE AREAWIDE PLAN

In this section you will find:

- I. A discussion of the basic management requirements for implementing the 208 plan including:
 - the authority required by Section 208 for an Areawide Management System; and
 - identification of the existing institutions which possess this required authority.

The placement of information on management authority and agencies at the front of this plan is an attempt to help the reader view the technical recommendations which follow in the context of implementation requirements.

I. MANAGEMENT AND PLANNING

A. The Legal/Institutional Requirements

Areawide water quality management plans developed under Section 208 of the Federal Water Pollution Control Act must be plans which can be implemented by the affected agencies. Section 208 and its attendant regulations place as much emphasis on the development of management mechanisms to implement the plan as they do on the identification of water quality problems or technical measures to correct them.

As water quality problems are defined and the appropriate solutions identified, 208 staff has examined the management agencies authority and capability to undertake these corrective measures. Because implementation of the plan is so crucial it is worthwhile first to set out the specific management authorities required in section 208. This will provide a frame of reference for the consideration of the corrective measures proposed in this plan with respect to the capabilities of management agencies in the MAPC 208 area.

To encourage a better understanding of the connections among the technical and management elements of the 208 plan, they will be integrated whenever possible. Each functional section of this plan (wastewater treatment, industrial discharges, stormwater management, etc.) is dealt with in a separate section in Part II of the plan. In each functional section the relevant management agencies are identified. Further background on management agencies is provided in Part II section 6. Part I of the MAPC-208 Areawide Plan presents implementation recommendations for the relevant federal, state regional and local agencies. Community-specific recommendations also are presented in Part I of the MAPC-208 draft Areawide Plan.

An understanding of the section 208 management authority requirements is helpful in understanding the scope of the Areawide Plan. Section 208 contains a number of 208 plan requirements. However, in terms of the

implementation of the plan, the consideration of adequate management agency authority must be preeminent. Most of the specific requirements for 208 management agencies are set out in section 208(c)(2). An individual management agency need not have all of the authorities listed in section 208 so long as it has authority to carry out its responsibilities, under the plan and the plan's proposed management agencies, in the aggregate, have all of those authorities.

Two additional factors have influenced the course of the management analysis in this plan: (1) EPA guidelines have encouraged the use of existing institutions and authority to implement the 208 plan rather than await major institutional and legislative change, and (2) as indicated below, Massachusetts and its municipal and regional entities have sufficient authority to carry out nearly all of the actions required in the plan. In Part I of this plan an Areawide Management System is presented. The system will consist largely of means of coordinating existing agencies and authority and identification of any new authority and resources needed to assure plan implementation.

The legal requirements for a 208 management system and the identification of existing institutions possessing management authority are set out below.

1. Authority to Carry Out Appropriate Portions of an Areawide Waste Treatment Management Plan. Section 208(c)(2)(A) requires that the designated management agency(ies) must have adequate authority "to carry out appropriate portions of an areawide waste treatment management plan developed under subsection (b) of this Section."

Subsection (b) sets out, in general, the areawide waste treatment management plan requirements. The plan must, of course, identify treatment works needed for a twenty year period and must establish processes to identify various sources of pollution, among other requirements. However, for purposes of identifying required management authorities this discussion focuses on the regulatory programs required by subsection (b).

Section 208(b)(2)(C) requires the establishment of a regulatory program to:

"(i) implement the waste treatment management requirements of section 201(c) (which states that "to the extent practicable, waste treatment management shall be on an areawide basis and provide control or treatment of all point and non-point sources of pollution including in place or accumulated pollution sources.")";

It is important to note that, while EPA regulations contain a clearly stated preference for point and non-point source management on a statewide and/or areawide basis,¹ there is no prohibition against locally administered regulatory programs (particularly for non-point sources), and local government agencies acting as designated management agencies within an areawide management system. It should also be noted that in Massachusetts the Division of Water Pollution Control under the authority of Mass. Clean Waters Act controls the discharge² of pollutants into the waters of the Commonwealth. Pollution is defined under that statute as "...a point or major non-point source..."³ The Division of Water Pollution Control also administers the state's grant program for the construction of treatment works.

"(ii) regulate the location, modification, and construction of any facilities within such area which may result in any discharge in such area";

The types of regulatory controls which may be used include land use controls, such as zoning authority and subdivision regulation, NPDES permits, building permits, wetlands permits, and other permits and licenses, and ability to modify water quality standards. The regulatory controls mentioned, as they are currently administered in Massachusetts, consider water quality factors to varying degrees. It is a primary concern with NPDES permits, administered jointly by EPA and MDWPC. Wetland protection regulations, waterways permits and subsurface sewage disposal regulations consider it to some extent, landfill regulations to a lesser extent. These aforementioned programs are administered by the state Dept. of Environmental Quality Engineering (DEQE).

Local controls, primarily zoning and health regulations, consider water quality to widely varying degrees. These controls are discussed in greater detail in subsequent sections of this plan dealing with non-point sources of pollution.

"(iii) assure that any industrial or commercial wastes discharged into any treatment works in such area meet applicable pretreatment requirements."

While the issue of pretreatment under PL 92-500, section 307(b) and (c) has not been conclusively resolved by EPA to date,⁴ a National Pretreatment strategy should be forthcoming from EPA. EPA has published detailed guidelines on pretreatment in accordance with section 304(f) of the Act.⁵ These guidelines contain technical information on pollutants which may interfere with or pass through publicly owned treatment works, and guidance to assist state and local governments in developing their own pretreatment programs to comply with NPDES permit conditions. General Condition 20 of each municipal/NPDES permit requires the permittee to have in effect a sewer use ordinance which prohibits the introduction of any pollutant which "is a toxic pollutant in toxic amounts" or is an "incompatible pollutant" or "has not been subjected to any pretreatment that may be required under Federal or State Law."

The Division of Water Pollution Control has permitting authority over any sewer extension or connection in the Commonwealth⁶ (this permitting authority could also be construed to cover the use of existing connections). If this permit program was fully in effect DWPC could exercise much greater control over the introduction of industrial wastes into municipal systems or the introduction of excessive flows into municipal systems, and it would give greater state control over the development and enforcement of local sewer use ordinances.⁷ It is also possible that this regulatory program could include water conservation measures, such as requiring, as a permit condition, the installation of water-saving shower heads, toilets, etc., especially in communities where excessive flows into the system were a problem, or where sewerage could result in the depletion of groundwater supplies. Local control over discharges to treatment works is carried out under Chapter 83, section 10 of the General Laws which permits cities and towns to prescribe "rules and regulations regarding the use of common sewers to prevent the entrance or discharge therein of any substance which may tend to interfere with the flow of sewage or the proper operation of the sewerage system..."

Additional authority can be found in Chapter 40 section 21(6) which allows towns to "make such orders and bylaws, not repugnant to law... for regulating, under a penalty not exceeding fifty dollars for each offense, the use of common sewers...".

The management system must include regulatory programs which apply to both point and non-point sources. The EPA guidelines state that a regulatory program must contain the following:

- 1) The identification of all pollution sources in each planning area and an indication of which agencies have been designated for their regulation.
- 2) An indication that agencies with regulatory responsibility possess the statutory authority, or have initiated legislative proposals to obtain the authority to carry out this activity and to utilize the specific forms of regulation called for in the program.
- 3) An indication of which form(s) of regulation (land use, permits, licenses, pretreatment standards, associated fiscal policies, etc.) will be applied to pollution sources.
- 4) Specification of the technical requirements to be incorporated into the regulation.
- 5) Provisions that those affected by regulation will have adequate notice, rights of appeal, and other legal safeguards to encourage full compliance.

The control of point sources as required under section 208 (b) (2) (C) (i) and s. 201(c) is largely carried out in Massachusetts under the National Pollutant Discharge Elimination System with joint permits issued by EPA and the Mass. Division of Water Pollution Control.

While the possible control programs for non-point sources of pollution are as diverse as the sources themselves, EPA has provided guidance on the necessary components of an approvable non-point source control program.⁸

A non-point regulatory program must include the following:

- "(a) Authority to control the problem which the program addresses (i.e., an activity, pollutant, or geographical area).
- (b) Authority to require the application of Best Management Practices and their periodic revision.
- (c) Monitoring and/or inspection authority.
- (d) Authority to implement the chosen control tool (i.e., permits, licenses, contracts, etc.).
- (e) Enforcement authority.
- (f) A designated management agency responsible for implementing the regulatory program with:

expertise in the subject matter to be controlled

adequate staff

adequate funding

the relevant authorities pursuant to Section 208(c)(2) and 40 CFR 131.11(o)."

A proposed program could be considered deficient if it has insufficient legal authority, inadequate rules and regulations, inadequate resources or an inadequate management agency. The regulatory program could utilize various types of control tools such as permits, licenses, contracts, notification bonding, leases, plans and various management techniques.

Non-regulatory programs to control non-point sources may be approvable is the following conditions are met:

- provision of an effective educational program to inform the affected public of the requirements.
- provision of adequate technical assistance and financial assistance.
- identification of Best Management Practices.
- agreement of a schedule of milestones, such as implementation, monitoring and program evaluation.
- agreement to reporting system (at least annual) to the Regional Administrator on progress made in implementation.

Non-regulatory programs which do not provide additional educational, technical or financial assistance or utilize techniques and institutions which have not been successful in the past shall not be acceptable.

Section 208(b)(2)(F)-(K) specifically requires the 208 planning agency to identify certain types of non-point sources of pollution and to establish procedures and methods to control such sources. They relate to agriculture and silvaculture, mining, construction activity, salt water intrusion, residual wastes and disposal of pollutants on land or below the surface which might affect groundwater or surface water. Where the specified activities are not significant in an area, they need not be the subject of 208 planning.⁹

See Part II, section 6 of this plan for a discussion of significant non-point sources of pollution in the 208 area and programs for their control.

2. Authority to Manage Effectively Waste Treatment Works and Related Facilities. Section 208(c)(2)(B) requires the waste treatment management agencies to have the authority "to manage effectively waste treatment works and related facilities serving such area" in conformance with the 208 plan. The requirement pertains to the waste treatment management agency's capability to perform those functions necessary to effective waste treatment. This would seem to include that plant operatives and related personnel are adequately

trained and operate with incentives for cost-effectiveness and are rewarded for high competence in performance; that the treatment plant's effluent and that of industrial users is adequately monitored; that the violations of water quality standards and effluent and pretreatment limitations are relatively few and minor and are being remedied speedily and effectively; and the waste treatment agency has sufficient manpower, fiscal resources and administrative expertise to carry out water quality management tasks. Checks and balances must also exist in order to keep financing in line and modify poor performance. These tasks, basically monitoring activities are within the authority of the Division of Water Pollution Control. The effective management must, of course be carried out by the local and regional waste treatment management agencies.

3. Authority to Design and Construct New Works and Operate and Maintain New and Existing Works. Section 208(c)(2)(C) requires that the management agency(ies) have the authority "directly or by contract, to design and construct new works, and to operate and maintain new and existing works..." There is some question whether this and other s. 208(c)(2) authorities generally pertain to the waste treatment management implementing agencies or to the supervisory management agency(ies). The former appears to be the correct interpretation, especially since s.208(c)(1) states parenthetically that the management agency(ies) "may be an existing or newly created local, regional, or state agency or political subdivision". The lead (or supervisory) management agency need not have waste treatment management authorities.

Existing waste treatment agencies would have little problem in satisfying this authority requirement. They can point to authority under state law, through a special act, through its power as an agency of a city or town, or through authority to contract out required functions to other parties, private or public.

4. Authority to Accept and Utilize Grants and Other Funds for Waste Treatment Management. Section 208(c)(2)(D) requires that the waste treatment management agency(ies) have adequate authority to accept and utilize grants or other funds from any source for waste treatment management purposes.

A strict interpretation of this subsection may create some problems as some proposed management agencies, while authorized to accept funds from federal and state government may not have the explicit authority to accept funds "from any source." Reference would have to be made to the enabling authority of each management agency. Since 201 grants (Step I) can only be made to designated management agencies where an applicable water quality management plan has been approved,¹⁰ it is important to insure that all agencies requiring 201 grant funds be clearly able to comply with this required authority.

5. Authority to Raise Revenues, Including the Assessment of Waste Treatment Charges. The requirement in section 208(c)(2)(E) that a management agency have the authority "to raise revenues, including the assessment of waste treatment charges" should be read in conjunction with s.204(b)(1)(A) which requires a system of user charges in which each recipient must pay "its proportionate share of the costs of operation and maintenance (including

replacement)...", and that industrial users of the treatment works pay "that portion of the cost of construction of such treatment works which is allocable to the treatment of such industrial wastes...". In general this provision is directed to assuring that management agencies have adequate authority to recover, in some manner, the costs associated with water quality management. In terms of municipal wastewater systems the costs generally fall into the following categories:

- operation and maintenance
- administration
- debt service
- annual capital outlays

For regulatory programs and many non-regulatory programs such as planning, costs are generally grouped into the administrative category. In selecting suitable cost recovery methods the following criteria should be applied:

- Equitability
- Economic efficiency
- Administrative simplicity
- Revenue adequacy
- Existing constitutional and statutory limitations
- Compliance with applicable EPA rules and regulations

While there are specific EPA requirements regarding costs related to operation and maintenance, and the recovery of the cost of treating industrial wastes (see below) the recovery of other management costs are limited only by existing constitutional and statutory constraints. Statutory changes to provide a greater range of or alternatives to present cost recovery methods can, of course, be recommended in water quality management plans.

Presently, wastewater treatment costs, other than those paid for by federal and state grant-in-aid programs, are generally recovered by the following methods:

- 1) Property Tax - the use of the property tax has long been a popular basis upon which to distribute the costs of public services, including sewage treatment costs. The primary advantage in recovering costs through local property tax receipts is in simplicity of administration. While this method generally cannot be used to recover operation and maintenance costs and cost recovery from industrial users, it may provide an acceptable basis for distributing debt service costs and excess capacity costs since typically property values rise as a result of the availability of public services such as sewers. Of interest to those assessed is that property taxes are deductible for federal income tax purposes while other forms of assessment generally are not. However, there may be little, if any, correlation between property value and the volume of wastewater discharges. Additionally, the regressive aspects of the property tax and need for some form of property tax relief in the Commonwealth makes this a less than ideal method of recovering wastewater management costs. The MAPC-208 plan submission recommends, as a general rule, that implementation costs

be met by means other than the use of the already overburdened property tax. In many instances this would mean the passage of state legislation to provide such property tax relief.

- 2) Special or Betterment Assessments - special assessment methods to recover the costs of lateral collection systems and service connections from the new recipients of sewer service are employed by many communities. Betterment assessments are an equitable method of revenue generation for such costs as capital expansion. Lateral sewer construction costs are often recovered through a combination of betterment assessments and general revenues (property tax).
- 3) Connection Fees - this method, generally a universal flat rate assessed at the time of connection, is used to recover both construction and administrative costs associated with the connection and the customer's service line from the lateral to the street or property line. (Note: the connection costs on private property are borne totally by the property owner. These costs vary with the length of sewer line required, soil condition, etc.)
- 4) User Charges - user charges are an increasingly important method of financing the local share of water pollution control expenditures, particularly for financing the operation and maintenance charges which are borne almost exclusively by local governments. They are computed in various ways but can generally be grouped into three categories:
 - a) charges which are levied at a flat rate totally independent of water consumption or sewage flows.
 - b) charges which are based, at least in part, on the quantity of water consumed or discharged.
 - c) charges which are based on variables such as meter size, number or type of plumbing fixtures, or number of employees, which may be presumed to vary imperfectly with water consumption or sewage discharges.
- 5) Surcharges/Industrial Charges - surcharges are sometimes assessed on industrial and commercial customers discharging wastes of greater than normal strength, generally utilizing the parameters of biochemical oxygen demand (BOD) and suspended solids (SS). As the industrial cost recovery provisions of the Federal Water Pollution Control Act are implemented (see below) the use of industrial surcharges should increase.

Sources of funds for regulatory programs generally include:

- fees or fines of various types
- revenues from waste treatment
- general governmental revenues

Other possible methods of recovering water quality management costs, assuming statutory and constitutional authority exists or can be obtained, include:

- General and selective sales taxes
- Payroll and employment taxes
- Income taxes
- Property transfer or recordation taxes
- Death taxes
- Business and occupational gross receipts taxes
- Excise taxes
- Gasoline, cigarette and liquor taxes.

Such tax instruments could be authorized by the state for special purposes of water pollution projects to be levied by the locality, by a regional authority or levied by the state and credited to the municipality via the cherry sheet. Another possibility is to modify federal legislation to finance more than the capital construction costs or consider the option that waste treatment facilities be privately operated and user charge financed. In considering each of these management cost recovery methods reference should be made to the criteria noted above (equitability, economic efficiency, administrative simplicity, revenue adequacy, constitutional and statutory limitations, compliance with EPA rules and regulations).

As mentioned above, the EPA has specific requirements for user charge systems for the recovery of operation and maintenance costs and the recovery of capital costs from industrial users for wastewater treatment systems funded by EPA 201 grants. In distributing the proportionate share of O&M costs to each user of the system, factors such as volume, strength and delivery flow rate characteristics should be considered. The use of ad valorem property taxes to pay for O&M costs has previously not been allowed.

However, the Clean Water Act of 1977 allows the use of dedicated ad valorem taxes where an applicant for 201 funds has previously used such a system and the administrator determines that the applicant has a system of charges which results in the distribution of operation and maintenance costs to each user class in proportion to the contribution to the total cost of operation and maintenance by each user class. Such a dedicated ad valorem tax system can only be used for residential user class and such small non-residential users as defined by the Administrator. It is unlikely that any Massachusetts community could qualify for the use of such a system under the guidelines now being developed by EPA.

While operation and maintenance costs generally should be recovered by a user charge system, such a system could also include capital and debt service costs, but is not required to do so.

"The user charge system may be designed to distribute costs to all users as a single class, or, alternatively, two or more classes of users may be identified, with each user paying the proportional share of the operation and maintenance costs assigned to that class. For the first year, operation and maintenance costs are to be based on experience in similar facilities or upon some other method that can be shown to be rational. The user charges must be reviewed annually and revised periodically to ensure fair and adequate cost recovery. The user charge system must be incorporated in a municipal ordinance or other legislative enactment. If the project is a regional one, each participating municipality must adopt a system of user charges.

"Quantity discounts are not allowed, and a user charge system based upon a percentage of the water bill can be used only if the charge for water is based upon a constant cost per unit of consumption. A surcharge may be levied when the concentrations of pollutants such as BOD and SS discharged by a user exceed the normal range of concentrations found in domestic wastewater. Each municipality must maintain records and documents which demonstrate compliance with the above requirements.

"EPA will make no payments in excess of 50 percent of the total construction grant amount unless a municipality has initiated work on a user charge system and can demonstrate that work is progressing satisfactorily. No more than 80 percent will be paid until such a system is approved by EPA, and evidence is given that the charges will be implemented."11

EPA also requires, for 201 grants awarded after March 1, 1973, that each industrial user of the treatment facilities make payments over a period of years (30 years or the useful life of the facilities, whichever is less). Such payments must equal the industry's allocated share of the 201 construction grant. The determination of this share must consider all factors which significantly influence the cost of the treatment works, including such factors as strength, volume, and delivery flow rate characteristics.

Section 24 of the Clean Water Act of 1977 exempts from ICR requirements, any industrial user which discharges 25,000 gpd or less of sanitary waste or a volume of process waste, or combined process and sanitary waste equivalent to 25,000 gpd or less, of sanitary waste if the discharge does not contain pollutants which interfere, or are incompatible with, or contaminate, or reduce the utility of sludge. Regardless of any subsequent change in the Act which might lower the volume of discharge exempted from ICR, industrial users exempt under the current law will never be liable for payments which might have been due after December 31, 1977, until a change in the Act. In addition, an ICR system can be based on a system wide approach, instead of being based on each individual project (regulations to be issued in May will provide guidance on this provision).

"At a minimum, an industry's share must be proportional to its flow in relation to the design flow capacity of the facilities. If there is a substantial change in the strength, volume or delivery flow rate characteristics of an industrial user's waste discharge, such share must be adjusted accordingly. If the treatment facilities are subsequently expanded or upgraded, each existing industrial user's share must be respectively readjusted again. An industrial user's share must include only that portion of the construction grant allocable to that user or to capacity firmly committed to that user; it must not include an interest component."12

Payments must be made at least annually with the first payment due not later than one year after the industry begins to use the facilities. These payments are actually repayments of the capital construction costs paid for by federal and state grants and local appropriations, and should not be

confused with the proportionate share of operation and maintenance costs which industry must pay through the user charge system.

An industrial user is "any non-governmental user of publicly-owned treatment works identified in the Standard Industrial Classification Manual, 1972, Office of Management and Budget, as amended and supplemented under the following divisions:

- Division A. Agriculture, Forestry and Fishing
- Division B. Mining
- Division D. Manufacturing
- Division E. Transportation, Communications, Electric Gas, and Sanitary Services
- Division I. Services"¹³

EPA further requires that each "significant industrial user" (one that will contribute greater than 10 percent of the design flow or design pollutant loading of the treatment works) sign a letter of intent agreeing to pay the portion of the federal grant allocable to the treatment of its wastes. These letters of intent are required prior to the award of a grant for either the design or construction of the treatment works.¹⁴

The municipality or district retains 50 percent of the amounts recovered from industrial users. The other 50 percent, including any interest earned on it, is returned annually to the U.S. Treasury. Eight percent of the amount retained by the municipality (including interest earned on it) can only be used for the eligible costs of the expansion or reconstruction of treatment works associated with the project and necessary to meet the requirements of the Act (PL 92-500). These retained amounts must be invested in:

- Obligations of the U.S. Government;
- Obligations guaranteed as to principal and interest by the U.S. Government or any agency thereof, or
- Accounts fully collateralized by obligations of the U.S. Government or, by obligations fully guaranteed as to principal and interest by the U.S. Government or any agency thereof.

The remainder of the retained amounts may be used as the municipality sees fit.¹⁵ No more than 50 percent of the construction grant (Step 3) will be paid unless the municipality has submitted evidence of the timely development of the industrial cost recovery system, and no more than 80 percent of the grant shall be paid unless EPA has approved the ICR system.

6. Authority to Incur Short- and Long-Term Indebtedness. Section 208 (c)(2)(F) requires that the waste treatment management agency(ies) have adequate authority to incur short and long term indebtedness.

The capacity to incur short-term indebtedness may be demonstrated by the ability to issue bond anticipation noted, grant anticipation notes, or to borrow from state agencies, and, to an extent, the ability to contract. The capacity to incur long-term debts may be demonstrated by the ability to issue general obligation bonds, revenue bonds, or the capacity to borrow from state agencies.

The ability of a management agency to incur debt is determined by its enabling statute. This is particularly true for sewerage districts. Municipalities are authorized to incur short-term debt in anticipation of revenue through the provisions of Chapter 44, section 4, of the General Laws. Municipalities may incur long-term debt, in general, pursuant to the provisions of section 7 and 8 of Chapter 44, which authorizes such debt for the purposes set forth, including sewer construction. Generally, there is a debt limit of 2½% for cities and 5% for towns of the equalized valuation of the city or town. This can be extended to 5% and 10% respectively, if approval is obtained from the Emergency Finance Board. Bonds for long-term debt can generally be issued for thirty years. Debt can be incurred outside of the debt limits noted above, with the approval of the emergency finance board, for certain activities, one of which is sewer construction. The incurring of debt can only be authorized by a two-thirds vote of a town meeting or city council.

It should be noted that the widespread issuance of municipal bonds for sewer construction in the Commonwealth may not only affect the marketability of such bonds, but will also reduce the ability of a municipality to incur debt for other municipal purposes. Consideration should be given to the establishment, by new legislation of a state bond bank, administered by the State Treasurer, which would issue general obligation bonds backed by the full faith and credit of the state. Such bonds could be issued on behalf of municipalities, to be repaid by such municipalities, for the purpose of financing local sewer construction. This would provide a better market for such bonds, and would have as great an impact on municipal bond issues for other public purposes. MDC's capital costs are currently financed under a system somewhat similar to this.

7. Authority to Assure that Each Participating Community Pay It's Proportionate Share of Treatment Costs. Section 208(c)(2)(G) provides that the waste treatment management agency(ies) must have adequate authority to assure, in implementing a waste treatment management plan, that each participating community pay its proportionate share of the treatment costs. This "proportionate share" requirement, of course, only applies where communities are joined together in a sewerage district or intermunicipal agreement for wastewater treatment purposes.

The "proportionate share" of treatment costs that each community must pay could, in application, be based on a multitude of considerations. Participating communities could be charged on the basis of actual wastes produced (considering flow rates and strength), or in accordance with the cost incurred to receive a community's wastes (due to distance from the treatment plant, for example), or might include a charge for the benefit accruing to a community (due to location of the plant outside its municipal limits). The basis for allocating the cost must be explained and justified to EPA. The following methods of sub-apportioning costs among communities have been

set out and discussed in the EMMA Study (Vol. 12, Part 2, pp V-22 to V-30):

- flow measurement
- water consumption
- population and population equivalent units
- residential units and residential equivalent units
- water production
- property value

Of perhaps even greater concern than how such treatment costs are apportioned among communities is how communities ultimately pay such apportioned costs. Methods of reducing the overall reliance on the local property tax to finance metropolitan services is an issue currently generating great interest in the Boston metropolitan area. Sewer use charges, currently used by a number of communities in the metropolitan area to finance at least a part of wastewater treatment costs will undoubtedly become more prevalent. Other methods of recovering costs, particularly capital costs, associated with municipal services and municipal services provided on a regional basis should be considered. Various local non-property taxing alternatives should be considered along with the financing of regional services by a regional district with non-property taxing powers. The appropriate cost recovery method would vary depending upon the solution and the management agency involved. Every effort should be made to recover costs by some method other than through the already overburdened property tax, except where the property tax is the locally preferred method.

8. Authority to Refuse to Receive Waste from Non-Complying Municipality. Of the section 208 (c)(2) requirements, the provisions that waste treatment agencies have adequate authority to impose sanctions on municipalities is perhaps the most controversial.

Section 208(c)(2)(H) requires that there be adequate authority "to refuse to receive any wastes from any municipality or subdivision, thereof, which does not comply with any provisions of an approved plan under this section applicable to such area." The provisions raise three questions for interpretation:

- What kind of sanction must be authorized?
- Against whom or what must the sanction be directed?
- For what kinds of non-compliance must the sanction be authorized?

On its face, s.208(c)(2)(H) would seem to require that a waste treatment agency have the authority to disconnect a participating municipality's (or other political subdivision's) sewer line hookup and/or to refuse future hookups where the municipality (or subdivision) was in non-compliance with any applicable aspect of a 208 plan, including land use control provisions.

EPA has stated that this authority should only be utilized in extreme cases, and where other methods, such as negotiations, fines, moratoria and court settlements have proved unsuccessful.

One problem with a literal interpretation of s.208(c)(2)(H) is that the cure is worse than the ill, and, therefore, it would not be administered in practice. A cutoff of a municipality's sewer connection would result, in most situations, in the discharge of untreated wastewater into streams, rivers or lakes. The untreated sewerage would create a water quality and a public health hazard. Because of the severity of the sanction and its counter-productive water quality effects, such a sanction would rarely, if ever, be used. Because it could not be used practically, it would not be an effective means of deterring non-compliance. Needless to say, such a sanction would probably never be used against a municipality which had failed to comply with non-waste treatment related 208 plan provisions.

It is doubtful whether Congress intended to require that sanctions be authorized which would probably never be utilized in practice, would be counter-productive if applied, and would not serve as an effective deterrent. Section 208(c)(2)(H) may be interpreted in such a manner that the sanctions would be both "realistic" and effective. The subparagraph should be construed in accordance with the policies implicit in it and s.208 generally. These appear to be:

- Sanctions should be practically effective;
- A sanction of last resort should be available for use;
- Sanctions should generally be aimed at those responsible for non-compliance;
- A means for pressuring municipalities to comply with 208 plan provisions should be available for use;
- Regionalization should be encouraged.

A study on 208 management commissioned by EPA¹⁶ suggests that the following authorities might satisfy s.208 (c)(2)(H).

- Authority to cutoff certain non-complying users;
- Authority to deny additional hookups to the system during periods of non-compliance or projected non-compliance;
- The right to impose fines, penalties, surcharges, or similar sanctions on the non-complying communities. (Including where non-compliance is non-waste treatment related.)

Although each of these authorities, by itself, seems to fall short before the rigor of the statutory language, taken together, they might well comply with s. 208(c)(2)(H).

The authority to cutoff individual users or groups of users might be a sufficient sanction where non-compliance with the 208 plan is attributable to the discharge of identifiable users. This authority could come into play where an individual user's discharge is causing the treatment plant to malfunction or violate effluent limitations or water quality standards. However, here again there is the problem of the cure being worse than the ill.

Where non-compliance exists or is projected, due to overloading of the capacity of the treatment works, authority to impose a moratorium on additional connections would probably be an adequate sanction. As the moratorium could be applied against all prospective users (or certain classes of users), within a municipality, it would be consistent with the clause that wastes may be refused "from any municipality or subdivision."

The director of the Division of Water Pollution Control is authorized to prohibit additional connections to treatment works if conditions of their discharge permits are being violated,¹⁷ including safeguards against excessive loadings.¹⁸

The right to refuse wastes could be construed as including the power to impose civil and criminal fines, surcharges or similar sanctions on non-complying users and communities. A community or district's ability to impose sanctions for violations of its sewer use ordinance or regulations should be referred to. The apparent requirement of authority to refuse wastes for non-compliance with 208 non-point source provisions may be satisfied by the imposition of fines and penalties for the violation of local or state statutes or ordinances dealing with such non-point sources of pollution.

It should be pointed out that one waste treatment management agency need not possess all the sanction authorities. A number of management agencies could constitute or apply s. 208(c)(2)(H) sanctions, especially if a broad interpretation of the subsection is permitted. The state division of Water Pollution Control or a regional sewerage district could impose the sanctions on non-complying users of the sewerage system, while suits for civil or injunctive relief, under existing statutes, could be brought against government agencies, including municipal agencies, for failure to perform their duties in accordance with law.

9. Authority to Accept for Treatment Industrial Wastes. Section 208 (c)(2)(I) appears straightforward but must be read in light of other s. 208 provisions. It requires that the management agency(ies) have the authority "to accept for treatment industrial wastes." EPA relates this authority to s.208(b)(2)(C)(iii) which requires approval to "assure that any industrial or commercial wastes discharged into any treatment works in such area meet applicable pretreatment requirements."¹⁹ It should also be construed in light of s.208(c)(2)(H). The previous discussion of these two requirements should be referred to.

To assist the reader in the consideration of whether existing wastewater management agencies, and possible future wastewater management agencies in the MAPC 208 area can meet the relevant requirements of Section 208(c)(2) the following chart is provided (Chart I). The requirements of S.208(c)(2)(A) ("to carry out appropriate portions of an areawide waste treatment management plan developed under subsection (b) of this section") are not included in the chart, since this generally refers to functions other than those of municipal wastewater management. Also, the requirement of s.208(c)(2)(B) ("to manage effectively waste treatment works and related facilities serving such area in conformance with any plan required by subsection (b) of this section") is also omitted as generally, enabling authority cannot be cited as ensuring that this requirement is met.

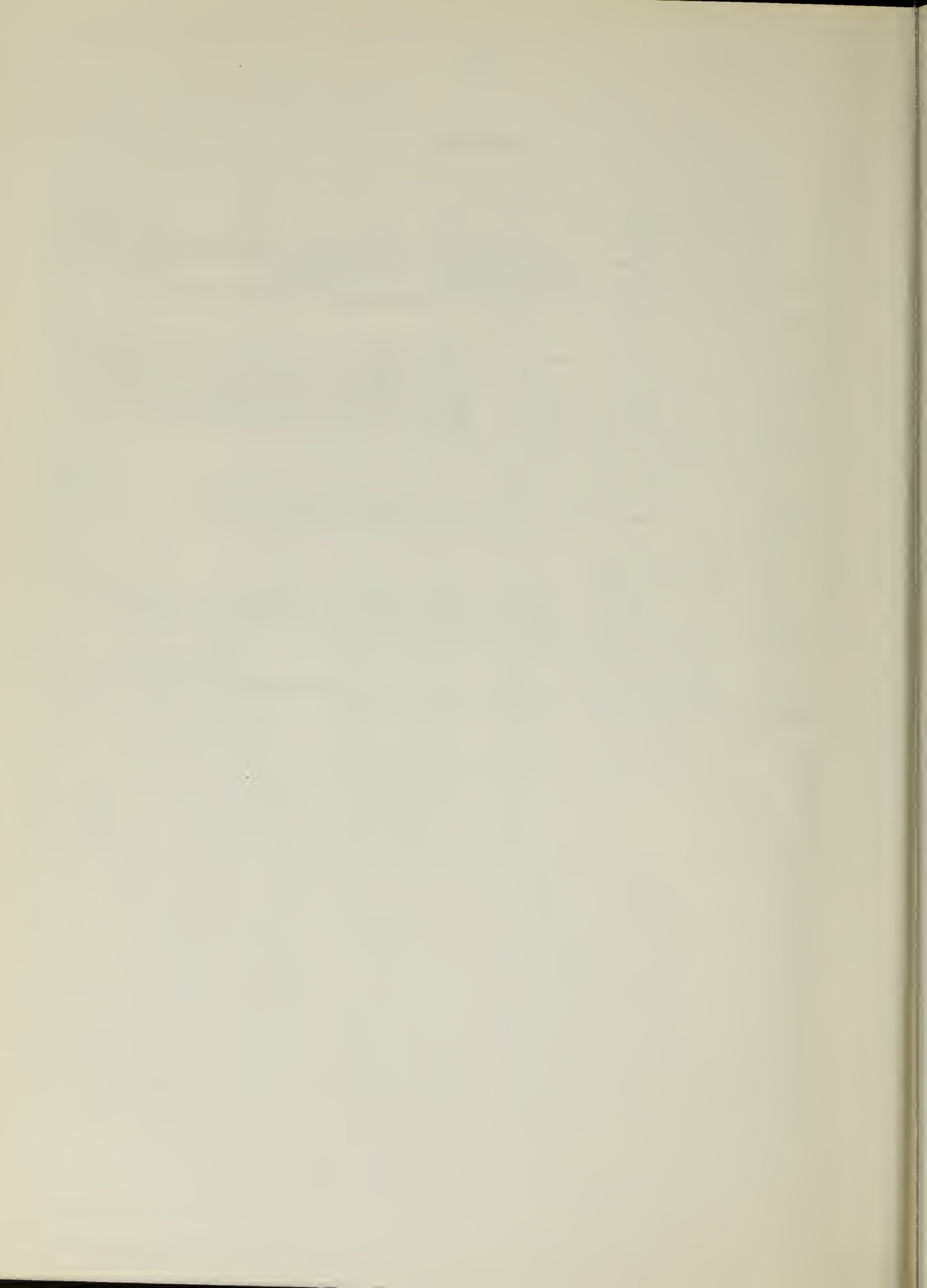
CHART I

Authority Required Under S. 208(C) (2)	Type of Sewerage Management					
	MUNICIPAL SYSTEM	INTERMUNICIPAL SEWER SERVICE AGREEMENT	SPECIAL DISTRICT	POLLUTION ABATEMENT DISTRICT*	SOUTH ESSEX SEWERAGE DISTRICT	METROPOLITAN DISTRICT COMMISSION
S. 208(C) (2) (c) "directly or by contract, to design and construct new works, and to operate and maintain new and existing works as required by any plan developed pursuant to sub-section (b) of this section;"	c.83 s.1	c.40 s.4A authorizes intermunicipal agreements. In most other respects the enabling authority is that cited for municipalities.	As specified in special act	c.21 s.30	St. 1925 c.339 and amending acts St. 1969 c.516	c.92 s.1 c.21 ss30A,31
S. 208(C) (2) (D) "to accept and utilize grants, or other funds from any source, for waste treatment management purposes;"	c.44 s.53A c.44 s.53B St.1945 c.74 c.21 s.30A	See municipal authority	c.44 s.53A and B St.1945 c.74 c.21 s.30A	c.21 ss.30, 31 c.44 ss53A, 53B St.1945 c.74	St.1969 c.516 c.44 ss.53A, 53B St.1945 c.74 c.21 s.30A	As specified in legislative petition c.21 ss.30A,31,33 (see also: c.44 s.53A, relate to c.44 s.1)
S. 208(C) (2) (E) "to raise revenues, including the assessment of waste treatment charges;"	c.59 c.83 ss.14,15 15A,16,17,20 c.80 s.1	See municipal authority	As specified in special act	c.21 ss.30, 35,36	St.1969 c.516 St.1975 c.101	c.92 ss.1-8A as amended by St. 1975 c.814
S. 208(C) (2) (F) "to incur short and long-term indebtedness;"	c.44 s.4 c.44 ss.7,8	See municipal authority	As specified in special act	c.21 s.35	St.1925 c.339 and amending acts St.1969 c.516	State Treasurer issues general Obligation Bonds pursuant to legislative approval of capital budget.
S. 208(C) (2) (G) "to assure in implementation of an areawide waste treatment management plan that each participating community pays its proportionate share of treatment costs;"	N.A.	Should be specified in agreement	As specified in special act	c.21 s.32,36	St.1969 c.516 St.1975 c.101	c.92 ss.5-7 as amended by St.1975 c.814
S. 208(C) (2) (H) "to refuse to receive any wastes from any municipality or subdivision thereof, which does not comply with any provisions of an approved plan under this section applicable to such area;"	N.A.	c.83 s.10 c.40 s.21(c) c.21 ss.27(9) (12) 43(2), 44(2) should be specified in agreement	As specified in special act	c.21 s.30 c.21 ss.27 (9) (12), 43(s), 44(2)	St.1925 c.339 as amended by St.1935 c.384 c.83 s.10 c.21 s.27(9) (12), 43(2), 44(2)	c.92 ss.2,8A St.1945 c.705,s.12 See also V Op. A.G. 559 1941 Op. A.G.37 c.21 s.44(2)
S. 208(C) (2) (I) "to accept for treatment industrial wastes."	c.83 s.1 c.83 s.10 c.40 s.21(6)	See municipal authority	As specified in special act	c.21 s.30 See also 1967-68 Op.A.G. 202	St.1925 c.339 as amended by St.1935 c.384 See also c.83 s.10 c.40 s.21(6)	C.92 s.6A

* Includes the Charles River Pollution Control District

FOOTNOTES

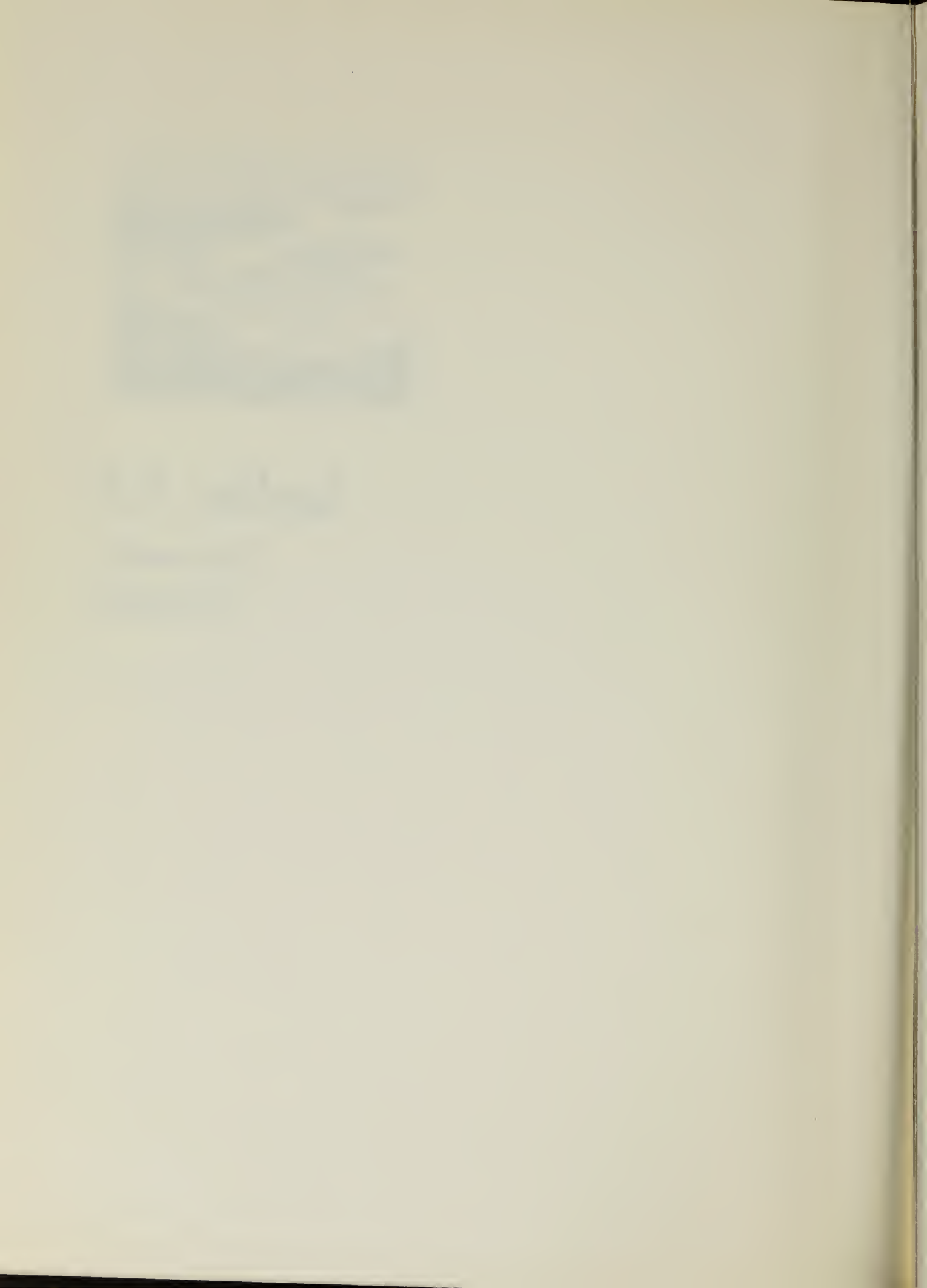
- 1) 40 CFR s. 131.11 (n)(3)(i)
- 2) G.L. c.21 s. 43(2)
- 3) G.L. c. 21 s. 26 a
- 4) See: "Proposed Environmental Protection Agency Pretreatment Standards" 42 FR 5986, Feb. 1, 1977.
- 5) "Federal Guidelines: State and Local Pretreatment Programs", January, 1977, Vols. 1-3, U.S. EPA.
- 6) G.L. c.41 s.43(2)
- 7) See generally "Summary of Work Done in 1976 by Edward Selig, Esq., under contract (Project 76013) with the Division of Water Pollution Control".
- 8) "EPA Draft Memorandum on Development of State and Local Section 208 Nonpoint Source Control Programs", reprinted in Current Developments, Bureau of National Affairs, Inc., Vol, 7, No. 50, at 1925.
- 9) 40 CFR s. 130.11(b)
- 10) S. 208(d) of P.L. 92-500.
- 11) "Wastewater System User Charges", Camp, Dresser & McKee, Inc., January, 1977, prepared for the Town of Holbrook, MA pp. 10-11.
- 12) Ibid.
- 13) 40 CFR 35.905-8
- 14) 40 CFR 35.925-12
- 15) 40 CFR 35.928.2
- 16) School of Public and Environmental Affairs, Indiana University, "Problems and Approaches to Water Quality Management" (October, 1973).
- 17) G.L. c.21 s.44(2)
- 18) G.L. c.21 s.43(9)
- 19) "Guidelines for Areawide Waste Treatment Management Planning", August, 1975, at 7-9.





Section 2.2

Wastewater Treatment



PART II, SECTION 2

WASTEWATER MANAGEMENT

In this section you will find:

- I. A description of wastewater treatment processes and:
 - A. The treatment concepts examined by the staff and the communities in the preparation of this plan.
 - B. Identification of the agencies responsible for wastewater management.
 - II. A discussion of cost estimation, including:
 - A. An explanation of how costs for treatment facilities were calculated for the minimum and maximum sewerage concepts for each community (with tables).
 - B. An explanation of septage treatment costs for each of the techniques examined (with tables).
 - III. Separate cost tables for each of the 92 communities showing cost breakdown for each of the three concepts.
 1. No Sewer
 2. Minimum Sewer
 3. Maximum Sewer
-

I. WASTEWATER TREATMENT

The basic purpose of wastewater treatment is to treat the water which has been soiled through human activity and render it safe for return to the environment. Improper sewage disposal can cause contamination of the drinking water supply and result in the spread of diseases. Also the discharge of improperly treated wastewater could result in the overall water quality degradation of receiving water bodies making their restoration almost impossible.

Treatment processes and systems can be classified in a number of ways. The most common method is by the function they perform. The majority of treatment plants are built for municipalities and, until very recently, have been restricted to a narrow group of operations and processes.

The terms primary, secondary and tertiary (or advanced) treatment should be understood.

- 1) Primary treatment of domestic wastes uses mechanical means and usually removes about 35 percent of biochemical oxygen demand (BOD) and 60 percent of suspended solids.

- 2) A correctly designed and operated secondary treatment plant can be expected to remove 85 percent of BOD and suspended solids by mechanical and biological means.
- 3) A tertiary (or advanced) treatment facility can remove 95 percent of BOD and suspended solids by mechanical and biological means and by removing residual or non-biological materials not removed through secondary treatment stage. Secondary treatment is the minimum treatment level allowed by law for wastewater discharged into the ocean or into streams which are classified as effluent limited. For water quality limited streams, removal of nutrients (nitrogen and phosphorous) is essential and advanced treatment is employed. Package plants are considered to provide an effluent of quality not less than that from a secondary treatment plant.

A. Treatment Concepts

Various treatment concepts were presented in preliminary basin reports. These concepts were generally based on the sewer alternative approach involving maximum and minimum sewer service expansion for the disposal of wastewater. Non-sewer alternatives which usually involve an effective maintenance and inspection program of subsurface disposal systems and may also require rehabilitation or reconstruction of certain malfunctioning systems were also discussed in the basin reports. A separate report titled "Regional Septage Disposal Alternatives in the MAPC-208 Study Area" developed alternatives for the disposal and treatment of septage.

In the basin reports, two to five wastewater management and treatment concepts were presented in detail. The primary object was to provide the residents of each basin with different conceptual schemes for handling wastewater flows and to assist them in assessing the structural alternatives available for wastewater treatment. In order to develop these conceptual configurations for wastewater treatment, it was necessary to delineate potential sewer service areas to alleviate present and future water quality problems. A methodology for the delineation of sewer service areas was prepared and a computer program was developed for the computation of waste flow as well as wasteload generation.

The number of concepts presented decreased in the later basin reports. This was the result of a vigorous effort by the staff to present only the most feasible alternatives so as to encourage and expedite the process of active public participation. The concepts were developed with awareness of the existing pattern of wastewater disposal as well as future possibilities for inter-basin and regional cooperation in wastewater management.

The concepts from the basin reports and the septage management alternatives from the Septage Management Report were carefully examined and evaluated to produce the three concepts in this draft Areawide Plan. Comments from most of the 92 communities in the project area also played an essential role in developing these areawide concepts.

- Concept I No Sewers - Septage Treatment
- Concept II Minimum Sewering
- Concept III Maximum Sewering

The concepts are not to be construed as final, definitive alternatives; they are the skeletons of detailed alternatives which can be derived by further study and the active participation of the 92 communities involved. Following is a brief explanation of each of the concepts.

Concept I - No Sewer Alternative. Under this concept, communities which have no public sewers shall continue to rely on subsurface disposal systems. A community under this concept must develop and implement an effective program of septic tank maintenance and inspection. Also, treatment and disposal of septage should be undertaken on a community or regional basis. For communities which are presently only partially sewered, no further extension of the existing sewer system would take place. However, septage disposal in an environmentally sound manner shall be carried out.

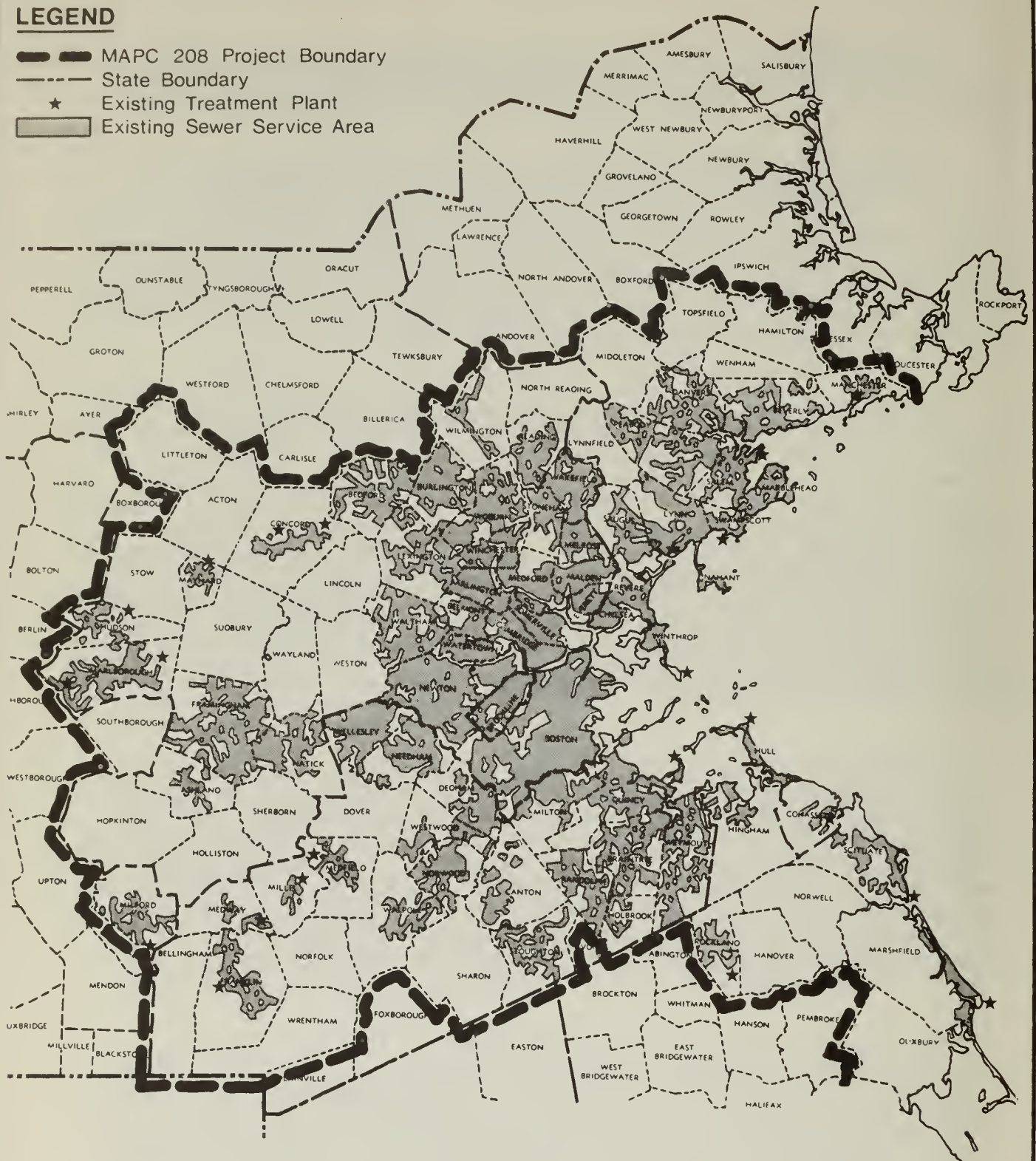
Concept II - Minimum Sewering. This concept is designed for the abatement of existing water quality problems only. It assumes that immediate sewer construction plans are not underway in the problem areas. Minimum sewerage arrangements generally result in the lowest capital and operational costs. Communities where no existing problems were identified would not need any sewers under this concept. This concept is essentially the same as the minimum sewerage concepts in the basin reports except that this concept also involves the implementation of appropriate septage management alternatives for communities with a substantial portion of their population using subsurface disposal systems. Small package plants or communal septic systems wherever applicable are also envisaged under this concept. Any changes to this concept as presented in the basin reports are reflected in Part I of this draft Areawide Plan under recommendations for individual communities.

Concept III - Maximum Sewering. Under this concept all potential sewer service areas as shown on the potential sewer service area map in each basin report would be sewered. The potential sewer service areas are those with existing water quality problems and those with potential problems as they are developed. This concept envisages the maximum expansion of sewerage facilities and generally entails the highest capital and O & M costs. The expansion and upgrading of existing treatment facilities was considered to be more economical than building new small treatment facilities in most cases. Any changes to this concept as presented in the basin reports as well as community specific recommendations would be presented in Part I of this draft Areawide Plan.

The Prevention Factor. It would be wrong to view any of these concepts as a full solution to the problem of water quality. To achieve and maintain clean water and to get full value for the current clean-up efforts, it is necessary to take steps to prevent future pollution. These preventive actions include land development controls, water conservation, prevention of landfill leachate pollution and road salt contamination. These actions should be viewed together with the appropriate wastewater treatment concept to form a comprehensive water quality program in each community. The methods of preventing future pollution problems are presented in Section 5 of this volume which focuses on solutions to non-point pollution problems and the institution responsible for their implementation.

LEGEND

-  MAPC 208 Project Boundary
-  State Boundary
-  Existing Treatment Plant
-  Existing Sewer Service Area



SOURCE: MAPC 208 Water Quality Project, Preliminary Reports, 1977.

Figure 1

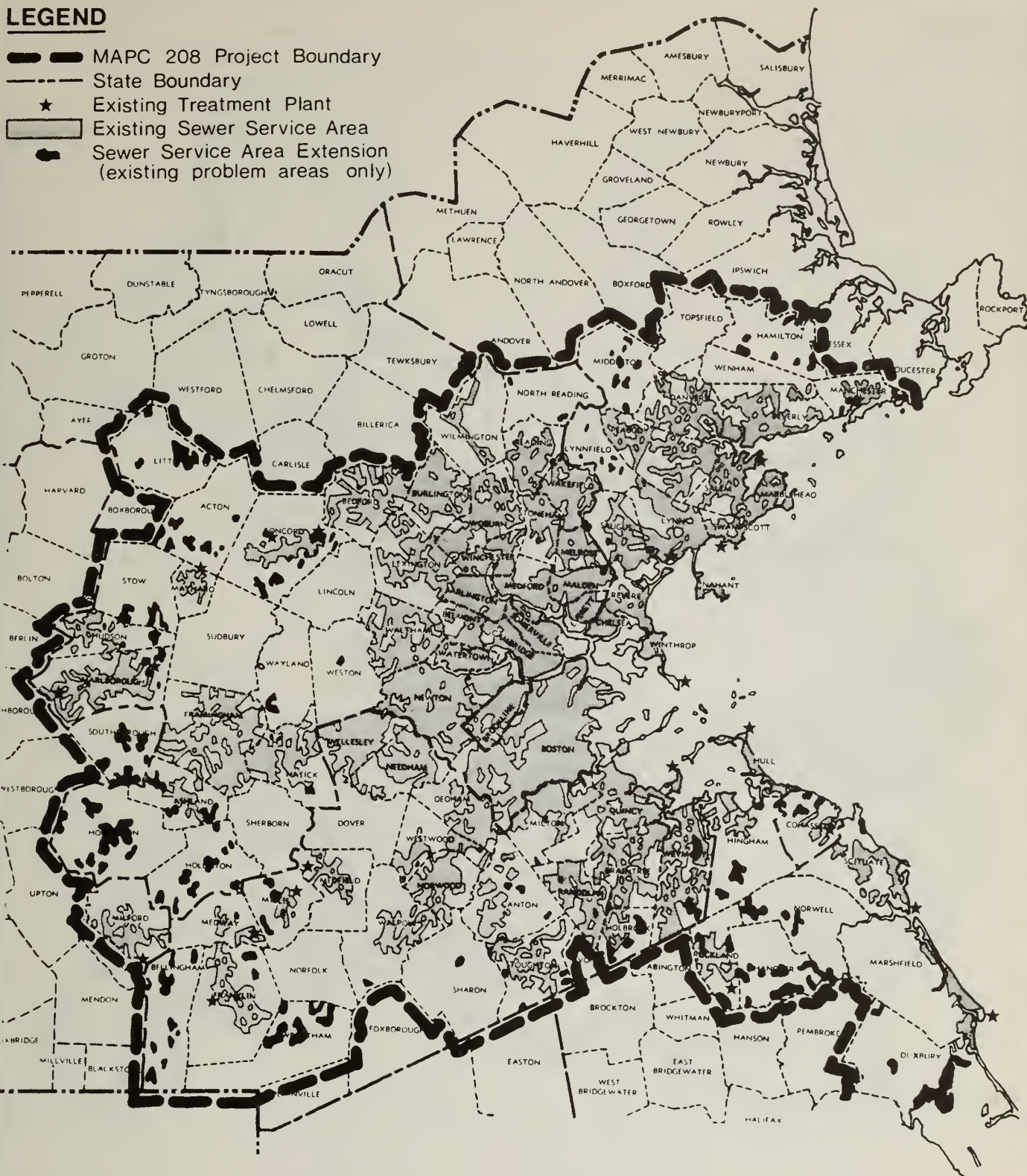
EXISTING SEWER SERVICE AREAS

0 5 10 miles



LEGEND

-  MAPCO 208 Project Boundary
 State Boundary
 Existing Treatment Plant
 Existing Sewer Service Area
 Sewer Service Area Extension
 (existing problem areas only)



SOURCE: MAPC 208 Water Quality Project, Preliminary Reports, 1977.

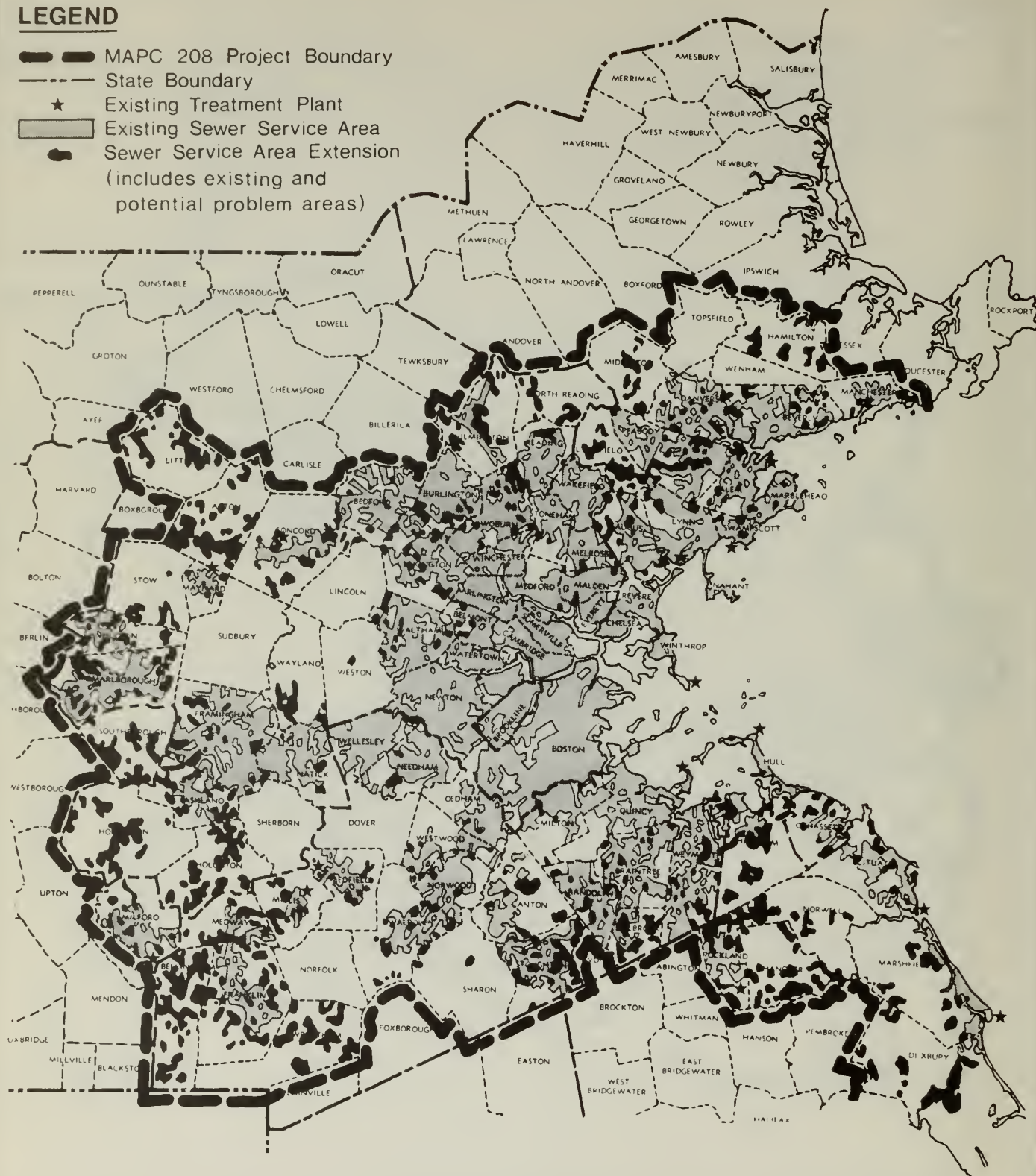
Figure 2

MINIMUM SEWER SERVICE EXPANSION



LEGEND

-  MAPCO 208 Project Boundary
 State Boundary
 Existing Treatment Plant
 Existing Sewer Service Area
 Sewer Service Area Extension
 (includes existing and potential problem areas)



SOURCE: MAPC 208 Water Quality Project. Preliminary Reports, 1977.

Figure 3

MAXIMUM SEWER SERVICE EXPANSION

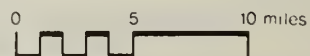


Table 2-1
Summary - **Total** Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Acton -	Concept 1	0	37,600	37,600
	Concept 2	300,000	31,300	331,300
	Concept 3	870,000	18,900	888,900
Arlington -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Ashland -	Concept 1	none	none ²	0
	Concept 2	165,000	none	165,000
	Concept 3	526,000	none	526,000
Bedford -	Concept 1	none	none ²	0
	Concept 2	165,000	none	165,000
	Concept 3	184,000	none	184,000
Bellingham -	Concept 1	none	24,800	24,800
	Concept 2	222,000	19,900	241,900
	Concept 3	709,000	3,000	712,000
Belmont -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	93,000	none	93,000
Beverly -	Concept 1	none	none ³	0
	Concept 2	none	none	0
	Concept 3	196,000	none	196,000
Boston -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Braintree -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	190,000	none	190,000
Brookline -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Burlington -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	176,000	none	176,000
Cambridge -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Canton -	Concept 1	none	none ²	0
	Concept 2	46,000	none	46,000
	Concept 3	345,000	none	345,000
Chelsea -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Cohasset -	Concept 1	none	15,800	15,800
	Concept 2	161,000	12,900	173,900
	Concept 3-I	539,000	4,400	543,400
	Concept 3-II	347,000	4,400	351,400
Concord -	Concept 1	none	28,300	28,300
	Concept 2	380,000	16,300	396,300
	Concept 3	511,000	13,500	524,500
Danvers -	Concept 1	none	none ³	0
	Concept 2	none	none	0
	Concept 3	170,000	none	170,000
Dedham -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	16,000	none	16,000
Dover -	Concept 1	none	13,300	13,300
	Concept 2	none	13,300	13,300
	Concept 3	none	13,300	13,300
Duxbury -	Concept 1	none	23,000	23,000
	Concept 2	808,000	1,800	809,800
	Concept 3-I	766,500	none	766,500
	Concept 3-II	806,000	none	806,000
Everett -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Framingham -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	506,000	none	506,000
Franklin -	Concept 1	none	21,600	21,600
	Concept 2	123,000	16,200	139,200
	Concept 3	553,000	2,500	555,500

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Hamilton -	Concept 1	none	13,100	13,100
	Concept 2	257,000	9,800	266,800
	Concept 3-I	595,000	3,000	598,000
	Concept 3-II	456,000	3,000	459,000
Hanover -	Concept 1	none	16,700	16,700
	Concept 2	625,000	1,000	626,000
	Concept 3-I	637,500	none	637,500
	Concept 3-II	772,000	none	772,000
Hingham -	Concept 1	none	45,100	45,100
	Concept 2	263,000	33,200	296,200
	Concept 3-I	971,000	none	971,000
	Concept 3-II	1,010,000	none	1,010,000
Holbrook -	Concept 1	none	none	0
	Concept 2	268,000	none	268,000
	Concept 3	873,000	none	873,000
Holliston -	Concept 1	none	26,200	26,200
	Concept 2	367,000	17,300	384,300
	Concept 3	789,000	4,800	793,800
Hopkinton -	Concept 1	none	11,600	11,600
	Concept 2	465,00~	3,000	468,000
	Concept 3	642,000	none	642,000
Hudson -	Concept 1	none	14,200	14,200
	Concept 2	157,000	6,900	163,000
	Concept 3	395,000	none	395,000
Hull -	Concept 1	none	210	210
	Concept 2	none	210	210
	Concept 3	44,000	none	44,000
Lexington -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	222,000	none	222,000
Lincoln -	Concept 1	none	12,100	12,100
	Concept 2	none	12,100	12,100
	Concept 3	none	12,100	12,100
Littleton -	Concept 1	none	15,100	15,100
	Concept 2	618,000	5,500	623,500
	Concept 3	519,000	4,500	523,500

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Lynn -	Concept 1	none	none	0
	Concept 2	none	none	0
	Concept 3	51,000	none	51,000
Lynnfield -	Concept 1	none	22,000	22,000
	Concept 2	118,000	19,300	137,300
	Concept 3-I	687,000	none	687,000
	Concept 3-II	856,000	none	856,000
Malden -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	14,000	none	14,000
Manchester -	Concept 1	none	6,700	6,700
	Concept 2	36,000	3,900	39,900
	Concept 3-I	43,000	4,200	47,200
	Concept 3-II	59,000	4,200	63,200
Marblehead -	Concept 1	none	none ³	0
	Concept 2	none	none	0
	Concept 3	49,000	none	49,000
Marlborough -	Concept 1	none	22,600	22,600
	Concept 2	183,000	6,400	189,400
	Concept 3	660,000	none	660,000
Marshfield -	Concept 1	none	42,800	42,800
	Concept 2	none	23,000	23,000
	Concept 3-I	493,500	5,800	499,300
	Concept 3-II	649,000	5,800	654,800
Maynard -	Concept 1	none	3,700	3,700
	Concept 2	42,000	1,700	43,700
	Concept 3	115,000	none	115,000
Medfield -	Concept 1	none	19,300	19,300
	Concept 2	17,000	19,000	36,000
	Concept 3	113,000	16,800	129,800
Medford -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	4,100	none	4,100
Medway -	Concept 1	none	14,700	14,700
	Concept 2	224,000	6,100	230,100
	Concept 3	302,000	4,200	306,200

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Melrose -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	51,000	none	51,000
Middleton -	Concept 1	none	9,500	9,500
	Concept 2	202,000	5,900	207,900
	Concept 3-I	260,000	3,800	263,800
	Concept 3-II	216,000	3,800	219,800
Milford -	Concept 1	none	11,900	11,900
	Concept 2	none	6,000	6,000
	Concept 3	176,000	none	176,000
Millis -	Concept 1	none	9,900	9,900
	Concept 2	209,000	5,900	214,900
	Concept 3	392,000	1,400	393,400
Milton -	Concept 1	none	none ²	0
	Concept 2	16,000	none	16,000
	Concept 3	66,000	none	66,000
Nahant -	Concept 1	none	none	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Natick -	Concept 1	none	none ²	0
	Concept 2	8,000	none	8,000
	Concept 3	139,000	none	139,000
Needham -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	54,000	none	54,000
Newton -	Concept 1	none	none ²	0
	Concept 2	none	none	4,500
	Concept 3	4,500	none	4,500
Norfolk -	Concept 1	none	13,100	13,100
	Concept 2	none	13,100	13,100
	Concept 3	none	13,100	13,100
North Reading -	Concept 1	none	21,600	21,600
	Concept 2	113,000	20,000	133,000
	Concept 3-I	370,000	16,200	386,200
	Concept 3-II	333,000	16,200	349,200
Norwell -	Concept 1	none	14,500	14,500
	Concept 2	404,500	5,400	409,900
	Concept 3-I	443,400	4,100	447,500
	Concept 3-II	538,000	4,100	542,100

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Norwood -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	125,000	none	125,000
Peabody -	Concept 1	none	none ³	0
	Concept 2	none	none	0
	Concept 3	184,000	none	184,000
Quincy -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Randolph -	Concept 1	none	none ²	0
	Concept 2	34,000	none	34,000
	Concept 3	212,000	none	212,000
Reading -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	238,000	none	238,000
Revere -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Rockland -	Concept 1	none	20,000	20,000
	Concept 2	470,700	5,500	476,200
	Concept 3	797,000	none	797,000
Salem -	Concept 1	none	none ³	0
	Concept 2	none	none	0
	Concept 3	98,000	none	98,000
Saugus -	Concept 1	none	18,300	18,300
	Concept 2	43,000	12,000	55,000
	Concept 3	298,000	none	298,000
Scituate -	Concept 1	none	25,100	25,100
	Concept 2	130,000	21,400	151,400
	Concept 3	467,000	11,000	478,000
Sharon -	Concept 1	none	27,800	27,800
	Concept 2	11,000	27,500	38,500
	Concept 3	29,000	26,900	55,900
Sherborn -	Concept 1	none	10,600	10,600
	Concept 2	none	10,600	10,600
	Concept 3	none	10,600	10,600

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Somerville -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Southborough -	Concept 1	none	12,000	12,000
	Concept 2	552,000	1,400	553,400
	Concept 3	646,000	none	646,000
Stoneham -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	25,000	none	25,000
Stoughton -	Concept 1	none	none ²	0
	Concept 2	26,000	none	26,000
	Concept 3	660,000	none	660,000
Stow -	Concept 1	none	14,100	14,100
	Concept 2	153,000	8,500	161,500
	Concept 3	232,000	8,500	240,500
Sudbury -	Concept 1	none	22,600	22,600
	Concept 2	none	22,600	22,600
	Concept 3	none	22,600	22,600
Swampscott -	Concept 1	none	none	0
	Concept 2	none	none	0
	Concept 3	35,000	none	35,000
Topsfield -	Concept 1	none	12,200	12,200
	Concept 2	none	12,200	12,200
	Concept 3	none	12,200	12,200
Wakefield -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	38,000	none	38,000
Walpole -	Concept 1	none	none ²	0
	Concept 2	2,700	none	2,700
	Concept 3	444,000	none	444,000
Waltham -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	54,000	none	54,000
Watertown -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0

Table 2-1 (cont.)
Summary - Total Average Annual Cost - 1995

Communities		Sewerage Component Cost, \$ /yr	Septage Component Cost, \$ /yr	Total Concept Cost, \$ /yr
Wayland -	Concept 1	none	17,200	17,200
	Concept 2	165,000	15,600	180,600
	Concept 3	384,000	10,300	394,300
Wellesley -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	19,000	none	19,000
Wenham -	Concept 1	none	7,000	7,000
	Concept 2	none	7,000	7,000
	Concept 3	9,500	6,900	16,400
Weston -	Concept 1	none	21,200	21,200
	Concept 2	none	21,200	21,200
	Concept 3	27,000	21,100	48,100
Westwood -	Concept 1	none	none ²	0
	Concept 2	30,000	none	30,000
	Concept 3	257,000	none	257,000
Weymouth -	Concept 1	none	none ²	0
	Concept 2	107,000	none	107,000
	Concept 3	559,000	none	559,000
Wilmington -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	716,000	none	716,000
Winchester -	Concept 1	none	none	0
	Concept 2	none	none	0
	Concept 3	30,000	none	30,000
Winthrop -	Concept 1	none ¹	none ²	0
	Concept 2	none	none	0
	Concept 3	none	none	0
Woburn -	Concept 1	none	none ²	0
	Concept 2	none	none	0
	Concept 3	97,000	none	97,000
Wrentham -	Concept 1	none	20,200	20,200
	Concept 2	85,000	17,600	102,600
	Concept 3	264,000	14,300	278,300

1. These communities are, for the most part, entirely sewered and members of the MDC.
2. Septage is treated at the MDC facilities.
3. Septage is treated (or will be) at the SESD facilities.

B. Identification of Wastewater Management Agencies

In order to identify management agencies involved in wastewater treatment, it is necessary to consider all aspects of wastewater management including planning, design, design approval, construction, construction approval funding, operation, maintenance and permitting. These management functions are allocated among four levels of government (local, regional, state and federal). A comprehensive report titled "Water Quality Management Alternatives" was prepared by the 208 staff which identifies the various wastewater management functions which must be performed and those activities to existing or possible future institutions. Additionally, Section 6 of Part I of this plan contains a description of the institutions responsible for implementation of the plan. The identification of management agencies that appears here will therefore be limited to a brief description of the relevant management agencies.

Federal Government. At the federal level, the Environmental Protection Agency is clearly the main agency involved in wastewater management. While there are some federal funds available for sewer construction from other sources (HUD and the Farmers Home Administration), the EPA, through its 201 construction grants program, is the primary federal funding source. Under section 201 of the Federal Water Pollution Control Act, EPA is responsible for the award of grants to any state, municipality, or intermunicipal or interstate agency for the construction of publicly-owned treatment works.

The primary objective of funding is to provide money for projects which, when completed, would result in the improvement of water quality to meet the goals of the Act. 201 grants are presently awarded in a 3-step process as follows:

Step 1 - Develop facilities plans and related elements.

Step 2 - Prepare construction drawings and specifications.

Step 3 - Fabricate and build treatment works.

EPA is authorized to pay the federal share of up to 75 percent of costs of the above steps. Under the Clean Water Act of 1977, the federal share can be increased to 85 percent for innovative or alternative wastewater treatment processes and techniques. In addition to responsibilities for administering the construction grant program, EPA also has permitting and enforcement responsibility under the FWPCA. Under the National Pollution Discharge Elimination System, EPA issues discharge permits to sewage treatment plants discharging to U.S. waters. In Massachusetts, joint permits are issued with the Division of Water Pollution Control.

State Government. The Department of Environmental Quality Engineering (DEQE) has extensive but not always exclusive, management responsibilities and authorities in wastewater management related areas. While it administers Title 5 of the State Environmental Code (dealing with subsurface sewage disposal) generally by setting minimum standards for local boards of health, DEQE also requires that mobile home parks and trailer parks, groundwater discharges of more than 15,000 gpd and all industrial waste facilities that discharge effluent to the ground obtain a permit from DEQE. Additionally, any town must get the approval

of DEQE prior to acquiring land for the purpose of constructing any sewage disposal works.

The Division of Water Pollution Control is within DEQE and is subject to the authority of the Water Resources Commission. The DWPC has the broadest authority in the state for water quality management. Its powers and duties include the encouragement of the adoption and execution of plans for the prevention, control and abatement of water pollution; cooperating with federal agencies and the agencies of other states in matters related to water quality control and assisting agencies of the Commonwealth and its political subdivisions with water pollution problems; taking all action necessary to secure to the Commonwealth the benefits of the Federal Water Pollution Control Act; conducting a program of study, research and demonstration relating to new and improved methods of pollution abatement or more efficient methods of water quality control; adopting minimum water quality standards for the Commonwealth; prescribing effluent limitations, permit programs, and where appropriate, prohibiting discharges; requiring discharges to establish monitoring, sampling, record-keeping and reporting procedures and facilities; examining periodically the water quality of the various coastal waters, rivers, streams, lakes and ponds of the Commonwealth and reporting the results; adopting regulations for the proper operation and maintenance of waste treatment facilities; conducting the continuing planning process for planning the reduction, control and elimination of the discharges to waters of the Commonwealth, including river basin plans and regional plans; adopting, amending or repealing, with the approval of the Water Resources Commission, rules and regulations for the proper administration of the laws relative to water pollution control and the protection of the quality and values of water resources and requiring the submission for approval of reports and plans for abatement facilities and inspecting the construction for compliance with such approved plans.

The DWPC develops the state's priority list which determines the priority to be given each category of projects for construction of publicly-owned treatment works within the Commonwealth. DWPC also administers the state construction grant funds which provide 15 percent of the capital construction costs of publicly-owned treatment works, which when combined with the 75 percent construction grants available from EPA, provide 90 percent state and federal funding for such treatment works. As noted above, DWPC issues joint permits with EPA for point source discharges to surface waters (including discharges from municipal treatment works). DWPC may also regulate groundwater discharges.

Regional Government. The Metropolitan District Commission is a state agency within the Executive Office of Environmental Affairs. It currently has an aggregate community membership of 54.

The Metropolitan Sewerage District (MSD) is a division of the MDC and presently serves 43 communities in eastern Massachusetts including the city of Boston. The sewage from the MSD flows through a system of sewers to either Deer Island or Nut Island in Boston Harbor for treatment and discharge. The MDC owns and controls interceptors, pumping stations, headworks, tunnels and treatment works serving its member communities. The communities themselves own and largely control the community system which is connected to the MDC interceptors. In 1975 the legislature amended the statute governing

the operation of the MSD in order to assure that MDC could comply with the requirements of the FWPCA. This statute gives the MDC more authority over the municipal systems and industrial connections, and establishes new procedures for apportioning costs to member communities. While detailed plans have been developed for the upgrading of MSD facilities (See EMMA), existing facilities suffer from age and obsolescence.

The South Essex Sewerage District (SESD) was created in 1925 by a special act of the state legislature. At that time, the District comprised the municipalities of Beverly, Danvers, Peabody, Salem and state and county institutions located in Danvers and Middleton. Special state legislation passed in 1972 allowed the towns of Marblehead and Middleton to become members of the District.

Marblehead and Gordon College in Wenham do not currently discharge wastewater to the District's facilities, but will do so in the near future when construction programs are completed. The District's wastewater facilities are administered by the South Essex Sewerage Board. The Board is comprised of a chairman (appointed by the governor), the Commissioner of Public Works from Beverly, the Director of Public Services from Peabody, the city engineer from Salem and representatives from Danvers and Marblehead. The district's facilities include pumping stations, interceptors and treatment facilities. Like the MDC, the municipal collection systems are owned and operated by the individual municipalities, but unlike the MDC, the SESD has limited authority over these municipal systems. The District has recently embarked on a four-phase program to expand and upgrade its facilities.

The Charles River Pollution Control District (CRPCD) was established in September 1973, according to the provisions of the Mass. Clean Waters Act, for the purpose of collecting and treating wastewaters from the two member communities of Franklin and Medway. The CRPCD does not currently have operating facilities, but interceptor sewers and a wastewater treatment plant are under construction and expected to be completed by spring 1979.

The District's facilities are administered by a Board of Commissioners consisting of four members (two each from Franklin and Medway). The District controls interceptor sewers and the treatment plant. Municipal collection systems are controlled by the individual municipalities.

Other Regional Wastewater Management Agencies. While no other regional wastewater management agencies currently exist in the MAPC 208 area, the concepts noted in this section would require, in some instances, the formation of such institutions. The structural configurations presented would allow the use of more than one type of management structure. For example, a pollution abatement district could be formed pursuant to the Mass. Clean Waters Act to manage a facility serving two or more communities, but an intermunicipal sewer service agreement between the communities (with one community actually owning the facility) would also be possible, as would a special district, formed by a special act of the legislature. Intermunicipal sewer service agreements are contractual agreement between municipalities. Such agreements currently exist between the communities of Northboro and Marlboro; Lynn, Nahant and Saugus; and Duxbury and Marshfield.

Local Government. At the municipal level, wastewater treatment works and collection systems can be controlled by a number of government entities, including sewer commissions or boards consisting of three elected commissioners, or the board of selectmen acting as the sewer commission or board and delegating its authority to a local sewer or public works department.

Municipalities are authorized to "lay-out, construct, maintain and operate" wastewater facilities and to control the use of such system, including the adoption of sewer use ordinances. The financing of such facilities are carried out under general municipal financing authority. Often the control of treatment facilities and the control of collection systems are carried out by different municipal departments.

II . COST ESTIMATION FOR WASTEWATER TREATMENT

This estimation is divided into two broad categories: (A) Wastewater Treatment Facilities; and (B) Septage Treatment Facilities. Under category (A) costs related to wastewater collection, i.e. sewers, treatment facilities and outfalls, etc. are discussed. Sewer costs include all sewer construction, street sewers as well as large interceptors and trunk sewers. House connection costs are not worked out mainly because such costs are very site specific and could vary from a couple of hundred dollars to a few thousand dollars. However, an average range of \$500-\$1200 could be considered reasonable for a house connection and should be taken into account while figuring out the total cost to a homeowner.

Under category (B) costs related to the septage management component for comprehensive wastewater management are given. Septage management generally involves the disposal of material pumped out from a septic tank into a receiving facility for further disposal and treatment.

A. Wastewater Treatment Facilities. The cost of wastewater treatment facilities can be broken into two major components, i.e. treatment cost and conveyance cost. Treatment costs related to the construction of treatment plants and package treatment plants are taken directly from the basin reports. (These appear on the community charts at the end of this section.) In order to present total sewerage (conveyance) costs the following methodology was used.

ESTIMATE FOR SEWER CONSTRUCTION COST (Laterals, Collectors and Interceptors)

The following assumptions/criteria were developed to arrive at reasonable cost estimates for communities where no other data or engineering reports were available. It should be emphasized that the actual costs may be significantly different from those estimated by using the following methodology, and that these costs are being developed only to compare various alternatives involving sewerage and non-sewerage options.

• Sewer Lengths

Length of sewers varies from 3.5 miles/1,000 pop. to 1 mile/1,000 pop. for small/moderate communities to large communities or cities.

- (a) 3.5 miles/1,000 population for community having population less than 10,000.

- (b) 2.0 miles/1,000 population for community having population between 10,000 and 30,000.
- (c) 1.5 miles/1,000 population for community having population between 30,000 and 50,000.
- (d) 1.0 miles/1,000 population for community having population greater than 50,000.

If a community is partly sewered (30 percent or more), a reduction of 20 percent in the required length of sewers is applied.

• Sewer Sizes

- 8" - diameter pipe covers 50 percent of the total length.
- 12" - diameter pipe covers 30 percent of the total length.
- 28" - diameter pipe covers 15 percent of the total length.
- 30" - diameter pipe covers 5 percent of the total length.

The above pipe sizes were selected in order to simplify the cost estimation process. Also these pipe sizes are the most commonly used in practice. It is assumed that the estimated costs obtained by using only the above sizes would compensate for other pipe sizes and the overall impact would be significant. This assumption was verified by comparing estimated costs with the estimates from Facilities plans of some communities in the 208 area.

• Pipe Material

- 8" and 12" diameter pipe would be of vitrified clay meeting the ASTM standard specification for Extra Strength Clay Pipe - bell and spigot joints.
- 18" and 30" diameter pipe should be constructed of reinforced concrete pipe meeting ASTM standards.

• Estimated Cost Basis

All cost estimates are based on March '77 costs, ENR 2500.

<u>Pipe Size</u> (inches)	<u>Average Depth of Excavation</u> (feet)	<u>Cost/ft.</u> (dollars)	<u>Cost/mile</u> (\$1,000)
8	5 - 8	42	221.8
12	8 - 10	49	258.7
18	10 - 12	59	331.5
30	12 - 20	135	712.8

• Estimated Total Cost of Sewering Per Mile

Based on the percentages given (See Sewer Size) for various pipe sizes, the breakdown of cost for sewerage one mile would be as shown below.

<u>Pipe Size</u> (inches)	<u>Cost</u> (\$1,000)
8	110.9
12	77.6
18	46.71
30	<u>35.64</u>

Total 270.9
Rounded to 271,000 dollars per mile

Total cost of sewerage one mile length = 271,000

Call 271 as 'Sewer Construction Cost Factor' or SCCF

Multiply required length of sewers in miles by the SCCF to get total cost of sewers in thousand dollars.

- Cost of local interceptors can be calculated by multiplying the length of sewers by a factor of 82.4. Cost would be in thousand dollars.
- Estimated cost of street sewers (laterals, collectors) = total cost of sewers minus cost of local interceptors (presented in the basin reports or calculated as above).
- Cost of interceptor does not include cost of regional interceptors or trunk sewers. Such costs are presented in the basin report for each community in a particular regional arrangement.
- No allowance was made in handling of traffic, utility lines and repairing. Also the SCCF does not include costs for special construction in high groundwater areas. No provision was made to include any land acquisition costs or any major pumping costs that might be involved. The sewer construction costs are based on average conditions of excavation and installation and include a 3 percent allowance for excavation through rock.
- All cost figures calculated above are most likely to be superseded by detailed cost estimation under the (s. 201) facilities plans or other detailed engineering studies. However, it is believed that the error in the estimates would be in the range of 10 to 20 percent.

Table 2-2
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: North-South

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
					I	II	I	II	Maximum Sewering	Minimum Sewering
Duxbury	14,700	0	14,700	13,500	9.37	9.02	3.82	3.47	5.55	5.10
Hanover	12,200	0	12,200	11,500	7.79	7.10	3.19	2.50	4.60	4.33
Marshfield	32,500	600	9,500*	0	6.05	5.79	2.47	2.21	3.58	0
Norwell	10,400	0	7,500	6,300	5.81	5.38	2.28	1.85	3.53	2.97
Rockland	20,000	6200	13,800	8,800	6.13	-	1.97	-	4.16	2.66
Scituate	21,500	3700	10,000	2,000	5.89	-	2.42	-	3.47	0.75

*Beyond present Facilities Plan.

Table 2-3
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: Weymouth

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Braintree*	45,000	36,400	5,300	0	0.33	0	0.1	0	0.23	0
Cohasset	10,500	600	5,400	2,000	5.14	1.90	1.58	0.58	3.561.72	1.32
Hingham*	24,500	3,900	20,600	4,300	11.81	2.33	4.03	0.71	7.786.37	1.62
Holbrook*	17,500	0	15,300	4,500	8.29	2.44	2.52	0.74	5.77	1.70
Hull	11,400	3,500	1,000	0	0.54	0	0.16	0	0.38	0
Randolph*	36,300	14,600	6,800	400	2.21	0.13	0.67	0.02	1.54	0.11
Weymouth*	62,500	40,100	22,400	4,800	4.86	1.04	1.48	0.32	3.38	0.72
			(*MSD)							

Table 2-4
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: North Coastal

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Beverly ¹	43,000	34,000	6,000	0	2.44	0	0.74	0	1.70	0
Danvers ¹	28,900	22,000	3,900	0	2.11	0	0.64	0	1.47	0
Lynn ²	78,300	79,400	3,100	0	0.81	0	0.26	0	0.55	0
Lynnfield	14,800	0	14,800	1,500	11.82	0.81	6.245.94	0.25	5.585.58	0.56
Manchester	7,300	3,300	(900)	(300)	0.68	0.23	0.210.21	0.07	0.470.48	0.16
Marblehead ¹	24,000	20,500	1,300	0	0.70	0	0.21	0	0.49	0
Nahant ²	4,600	3,500	0	0	0	0	0	0	0	0
Peabody ¹	49,500	35,000	4,400	0	1.79	0	0.54	0	1.25	0
Salem ¹	42,200	39,200	3,000	0	1.22	0	0.37	0	0.85	0
Saugus ²	29,200	17,400	8,600	1,100	5.06	1.01	1.82	0.58	3.24	0.42
Swampscott	16,000	14,000	1,000	0	0.54	0	0.16	0	0.38	0
Wakefield ³	31,500	25,000	1,100	0	0.60	0	0.18	0	0.42	0

1 - SESD
2 - Lynn STP
3 - MSD

Table 2-5
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: Ipswich

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Burlington*	28,500	19,500	800	0	0.43	0	0.13	0	0.30	0
Hamilton	8,600	0	6,700	2,100	6.95	1.99	2.53	0.61	4.42	1.38
Middleton	6,100	0	2,900	1,300	4.25	1.33	2.34	0.47	1.91	0.86
N. Reading	15,400	0	3,900	1,000	6.70	0.95	4.12	0.29	2.58	0.66
Reading*	30,500	20,100	6,700	(50)	2.72	Neg.	0.83	Neg.	1.89	Neg.
Topsfield	8,900	0	0	0	0	0	0	0	0	0
Wenham	4,700	0	150	(50)	0.14	Neg.	0.04	Neg.	0.10	Neg.
Wilmington*	22,000	500	14,400	0	7.80	0	2.37	0	5.43	0

(*MSD)

Table 2-6
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: Upper Charles

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Bellingham	18,500	-0-	16,300	3,700	11.52	3.32	5.42	1.93	6.1	1.39
Dover	9,000	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Franklin*	22,900	7,200	13,900	3,800	6.02	1.65	2.3	0.63	3.72	1.02
Holliston	19,000	-0-	15,600	6,700	12.5	6.6	6.5	4.1	6.0	2.5
Medfield	11,400	2,000	1,300	300	0.7	0.2	-0-	-0-	0.7	0.2
Medway*	10,900	300	7,300	6,200	3.96	3.36	1.2	1.02	2.76	2.34
Milford	27,500	20,400	7,100	-0-	3.1	-0-	1.2	-0-	1.9	-0-
Millis	9,400	2,500	5,000	2,800	5.9	3.12	3.3	1.65	2.6	1.47
Norfolk	8,900	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Sherborn	5,100	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Wrentham	13,000	-0-	3,900	1,700	5.24	2.82	3.78	2.18	1.46	.64

* (CRPCD)

Table 2-7
COST OF SEWERAGE - MAJOR SYSTEMS

BASIN: SuAsCo

Community	1995 Population	Present Sewered Population (1975)	Population to be sewered under Maximum Sewering Concept (1995)	Population to be sewered under Minimum Sewering Concept (1995)	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
ACTON	26,250	-0-	13,200	4,500	\$13.0	\$2.44 M	\$8.0 M	\$1.61 M	\$5.0 M	\$0.83 M
ASHLAND	12,500	2,140	10,270	3,365	8.1	4.36	4.2	3.06	3.9	1.3
BEDFORD	15,900	5,780	4,600	2,670	* 2.0	* 1.0	0.6	0.3	1.4	0.7
CONCORD	24,500	5,540	9,900	7,500	8.0	3.25	5.0	1.25	3.0	2.0
FRAMINGHAM	82,000	61,500	15,800	-0-	7.61	0	5.24	0	2.37	0
HOPKINTON	7,800	-0-	7,800	5,800	9.9	8.0	4.75	4.2	5.15	3.8
HUDSON	22,000	12,400	9,600	5,000	4.17	2.17	1.5	0.6	2.67	1.57
LITTLETON	9,900	-0-	6,900	6,300	8.5	8.0	4.0	3.8	4.5	4.2
MARLBOROUGH	40,000	25,900	14,100	8,900	4.6	2.9	1.4	0.9	3.2	2.0
MAYNARD	11,100	8,900	2,200	1,200	0.95	0.52	0.3	0.04	0.65	0.48
SOUTHBOROUGH	8,300	-0-	8,300	7,400	10.7	9.9	5.2	4.9	5.5	5.0
STOW	6,400	-0-	2,600	2,600	2.5	2.5	0.4	0.4	2.1	2.1
SUDBURY	21,700	-0-	-0-	-0-	0	0	0	0	0	0
WAYLAND	18,000	-0-	7,200	1,600	4.8	2.0	1.2	0.3	3.6	1.7
(*Beyond Present Facilities Plan)										2-26

Table 2-8
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

Table 2-9
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: Lower Charles

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Belmont*	29,200	26,100	3,100	0	1.34	0	0.41	0	0.93	0
Boston*	638,000	639,000	0	0	0	0	0	0	0	0
Brookline*	62,000	59,000	0	0	0	0	0	0	0	0
Cambridge*	105,500	102,000	0	0	0	0	0	0	0	0
Dedham*	28,000	24,200	600	0	0.26	0	0.08	0	0.18	0
Lexington*	36,000	25,200	10,800	0	3.51	0	1.07	0	2.44	0
Lincoln	8,800	0	0	0	0	0	0	0	0	0
Natick*	35,100	24,900	6,700	400	2.18	0.13	0.66	0.04	1.52	0.09
Needham*	32,800	25,500	2,600	0	0.85	0	0.26	0	0.59	0
Newton*	91,500	71,400	300	0	0.07	0	0.02	0	0.05	0
Waltham*	61,000	54,000	3,900	0	0.85	0	0.26	0	0.59	0
Watertown*	37,800	36,000	0	0	0	0	0	0	0	0
Wellesley*	27,500	23,900	700	0	0.30	0	0.09	0	0.21	0
Weston	14,500	0	800	0	0.43	0	0.13	0	0.30	0
			(*MSD)							

Table 2-10
COST OF SEWERAGE - MAJOR SYSTEMS
(All Costs in Million Dollars)

BASIN: Neponset

Community	1995 Population	Present Sewered Population 1975	Population to be sewered under Maximum Sewering Concept 1995	Population to be sewered under Minimum Sewering Concept 1995	Total Cost of Sewering		Interceptor/Trunk Sewer Cost (Grant Eligible)		Street Sewer Cost - Laterals, Collectors (Grant Ineligible)	
					Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering	Maximum Sewering	Minimum Sewering
Canton*	24,800	13,500	8,500	900	4.20	0.39	1.63	0.12	2.57	0.27
Milton*	28,300	25,600	1,400	600	1.01	0.26	0.58	0.08	0.43	0.18
Norwood*	39,800	30,900	2,800	0	0.91	0	0.28	0	0.63	0
Quincy*	95,500	91,500	0	0	0	0	0	0	0	0
Sharon	19,000	0	200	200	0.11	0.11	0.03	0.03	0.08	0.08
Stoughton*	33,000	10,000	20,000	1,300	7.57	0.42	3.0	0.13	4.57	0.29
Walpole*	21,200	6,100	9,700	100	10.21	0.04	7.28	0.01	2.93	0.03
Westwood*	18,100	5,700	7,700	1,100	3.34	0.48	1.02	0.15	2.32	0.33
			(*-MSD)							

B. Septage Treatment Facilities:

Cost of septage treatment facilities can be broken into two major components i.e. hauling cost and treatment cost. Hauling cost would include septage pumping and hauling to a treatment facility. Treatment cost would include the cost of construction of a septage treatment facility and its operation and maintenance cost. Hauling costs related to pumping and maintenance of septic systems are shown below. More detailed discussion about inspection and maintenance programs can be found under Non-Point Source Pollution (section 5) in this volume of the draft Areawide Plan.

SEPTIC TANK PUMPING/HAULING COSTS

Number of Systems Serviced Annually	Approximate Cost to Owner Without Federal Assistance	With Federal Assistance
400	\$50	\$41
600	\$34	\$27
800	\$25	\$21
1000	\$20	\$16

Cost estimates for septage treatment and disposal were assembled from a very limited data base due to the small number of septage treatment facilities in operation (particularly facilities using some of the newer technologies) and the small amount of attention awarded these facilities by State and Federal waste treatment authorities.

A summary of costs for septage treatment alternatives is presented in Table 2-12. It can be seen from this Table that the costs for septage treatment by any of the alternatives presented range from \$10 to \$44 per 1000 gallons per year. This is an adequate reflection of the actual range of costs which would be incurred by a municipality or regional configuration which opted for septage treatment and disposal as its waste management program. More detailed cost estimated can be arrived at only through actual preliminary design at the facilities planning level of detail. A sample inspection-maintenance program with estimated costs is presented in Table 2-11.

Table 2-11

INSPECTION-MAINTENANCE PROGRAM
MUNICIPAL STAFF AND TOWN-OWNED SEPTAGE PUMPER*

<u>Personnel - Inspection Team and Vehicles</u>	<u>Subtotal</u>	<u>Yearly Total</u>
Chief inspector: one(1) @ \$12,000	\$12,000	\$12,000
Assistant inspector: two(2) @ \$10,500	21,000	21,000
Clerk-Secretary: one(1) @ \$8,000	8,000	8,000
<u>Vehicles - Inspection Team</u>		
Three vehicles in use 200 days/yr.		
Debt service 6-year vehicle life		2,500
Operating, maintenance, insurance		
15,000 mi. each yr. @ 0.15/mi.	6,750	<u>6,750</u>
		\$50,250

SEPTAGE PUMPER UNIT

<u>Personnel</u>		
Operator-Driver (1) \$10,000	10,000	10,000
<u>Vehicle</u>		
Pumping truck \$20,000		
Ammortization and debt (8% interest)		
service over 5 years	6,440**	6,440**
Truck operation, maintenance, insurance		
15,000 mi/yr. @ \$0.25/mi.	3,750	<u>3,750</u>
		\$20,190

*Source: MAPC Water Quality Project, May, 1977

**With federal repayment of 75% of purchase cost
 at 1/5 balance due per year, subtract 3,750/year.....\$16,440

Table 2-12
SUMMARY OF COSTS FOR SEPTAGE TREATMENT ALTERNATIVES

Annual Cost Per 1000 Gallons

Design Flow
(1000 gal)

Capital

O & M

Total

Comments

A. Lagoons - Separate Aerobic
and Anaerobic Lagoons

15	-	-	15.00	Design Example
1.3	12.69	5.40	18.09	Aerobic Lagoon
AVERAGE			16.55	Both include Amortised Capital at 7% for 20 years and Annual O & M

B. Anaerobic - Aerobic
Lagoon Systems

15	-	-	44.00	Design Example Includes Amortised Capital at 7% for 20 years and Annual O & M
----	---	---	-------	--

C. Rotating Biological Media

100	-	-	2.03	Design Example for wastewater treatment
500	-	-	0.92	facility - Assumes
1000	-	-	0.78	Amortised Capital at
2000	-	-	0.62	6 1/2% for 25 years

Assumed Total Annual Cost per
1000 gallons = 10.00

As no design information
for such facilities for
septage treatment is
available and as septage
flow rates are expected
to be far below minimum
flow of design examples
shown, costs are assumed
to increase by a factor
of 5.

D. Composting

7.65	5.70	21.82	27.52	Assumes Amortised Capital at 7% for 20 years
15.	1.29	5.76	7.05	
25.	1.43	6.03	7.45	
AVERAGE	2.80	11.20	14.00	

Table 2-12 (cont'd)
SUMMARY OF COSTS FOR SEPTAGE TREATMENT ALTERNATIVES

		Annual Cost Per 1000 Gallons			Comments
	Design Flow (1000 gal)	Capital	O & M	Total	
E. Land Application - Subsurface Disposal	8.5	10.51	6.87	17.38	Assumes Amortised Capital at 7% for 20 years
	8.5	17.12	10.99	28.11	
	8.5	21.06	9.16	30.22	
	52	1.08	3.29	4.37	
	50	2.50	3.13	5.63	
	25	5.64	5.40	11.04	
		AVERAGE	9.65	6.47	16.12
F. Lime Stabilization/Sand Bed Dewatering	5.0	13.69	19.04	32.73	Experimental facility and Design study - only source of data available
G. Chemical Oxidation - Purifax	2.74	46.20	3.55	49.75	Assumes Amortised Capital at 7% for 20 years
	25.	21.49	14.71	36.20	
	65.	7.05	9.24	16.29	
	AVERAGE	24.91	9.16	34.07	
H. Co-Treatment - Activated Sludge	4.38	4.48	4.76	9.24	Assumes Amortised Capital at 7% for 20 years
	8.5	10.49	19.23	29.72	
	50.	7.25	3.95	11.20	
	60.95	9.87	2.73	12.60	
	AVERAGE	8.02	7.67	15.69	

III. TREATMENT CONCEPTS AND COST ANALYSIS

A cost analysis for all three concepts for sewerage and septage management for the 92 communities is presented on the following tables. It should be emphasized that this is not a cost-effective analysis but rather a presentation of comparative costs. It should be understood that only in-depth engineering studies can develop costs sufficiently precise for funding or detailed design. A cost effective analysis should address issues related to political, social and environmental aspects of a recommended plan. The cost analysis presented here can be broken, as before, into two categories:

1. Wastewater Treatment Facilities (sewerage component).
2. Septage Treatment Facilities (septage component).

Costs related to the sewerage component are broken down as follows to get the total average annual local cost for each community.

Sewerage Component:

Total Capital Cost

- Treatment Cost
- Conveyance Cost

Grant Eligible Cost

Grant Ineligible Cost

Federal/State Share

Local Share

Average Annual Local Share,

Annual O & M Costs,

Total Average Annual Cost

Grant eligible cost consists of the treatment plant cost and the cost of sewers excluding the cost of lateral sewers. Federal/State share is taken as 90 percent of the total grant eligible cost. Therefore, the total local share of cost is the total capital cost of sewerage component minus the Federal/State share. The local share was amortized at 6 percent annual interest for 20 years to get the total average annual cost to the town by using the following formula:

$$\text{Total Average Annual Cost} = C_i + \frac{C_i}{(1+i)^n - 1} + \text{Com}$$

C = capital cost

i = annual rate of interest

n = number of years

Com = annual operation and maintenance cost

The above formula uses the so called "sinking fund method" of evaluating annual costs. However, no allowance was made for the salvage value of equipment after 20 years which, if taken into account, could result in slightly lower annual costs.

Costs related to the septage component are broken down as follows:

Septage Component:

Average Total Annual Cost

Total Annual Capital Cost

Federal/State Share

Local Share

Annual O & M Costs

Total Annual Local Cost

The average total annual cost of septage component are derived from the MAPC 208 Septage Management Report. An average annual cost figure was obtained for each community by getting an average cost figure for the eight technical alternatives discussed in that report. Costs for some alternatives may be understated due to the combination of averaged costs and the low septage quantities projected for many communities in the Septage Management Report.

Capital costs of septage treatment component is taken as 60 percent of average total annual cost whereas 40 percent is allocated as Operation and Maintenance cost. State and Federal share is calculated as 90 percent of the capital cost with 10 percent as the local share. Therefore total annual local cost is obtained by adding the annual Operation and Maintenance cost to the local share of the capital cost.

The total concept cost (average annual) to a community is the sum of sewerage component cost and septage component cost for a particular concept. These community specific cost tables provide a comparison of costs in terms of annual dollars which a community will have to come up with for implementing a sewer or no sewer alternative. The staff's conclusion and/or recommendation in favor of an alternative is indicated in Part I of the Areawide Plan. Also cost impacts for the staff's preferred alternative are calculated in the same section of the draft Areawide Plan. (For a discussion of the existing and potential revenue sources for payment of these costs, see Part II, section I of this Areawide Plan.)

Community: Acton

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$8,640,000 6,200,000 2,440,000 7,030,000 1,610,000 6,330,000 2,310,000 200,000 100,000 300,000	\$30,800,000 17,800,000 13,000,000 25,800,000 5,000,000 23,200,000 7,600,000 660,000 210,000 870,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$81,700 49,000 44,100 4,900 32,700 37,600	68,000 40,800 36,700 4,100 27,200 31,300	41,000 24,600 22,100 2,500 16,400 18,900
Total Concept Cost (Average Annual)	37,600	331,300	888,900

Community: Arlington

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-37
Total Concept Cost (Average Annual)			

Community: Ashland	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$4,360,000 - 4,360,000 3,060,000 1,300,000 2,750,000 1,610,000 140,000 25,000 165,000	\$8,100,000 - 8,100,000 4,200,000 3,900,000 3,780,000 4,320,000 400,000 126,000 526,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	-0-	165,000	526,000

Community: Bedford

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$1,000,000 - 1,000,000 300,000 700,000 270,000 730,000 140,000 25,000 165,000	\$2,000,000 - 2,000,000 600,000 1,400,000 540,000 1,460,000 127,000 57,000 184,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	-0-	165,000	184,000

Community: Bellingham

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	\$7,930,000	\$24,220,000
- Treatment Cost		4,610,000	12,700,000
- Conveyance Cost		3,320,000	11,520,000
Grant Eligible Cost		6,540,000	18,120,000
Grant Ineligible Cost		1,390,000	6,100,000
Federal/State Share		5,890,000	16,310,000
Local Share		2,040,000	7,910,000
Average Annual Local Share, /yr.		177,000	690,000
Annual O & M Costs, /yr.		50,000	19,000
Total Average Annual Cost, /yr.		222,000	709,000
<u>Septage Component:</u>			
Average Total Annual Cost		43,300	6,600
Total Annual Capital Cost	\$54,000	26,000	4,000
Federal/State Share	32,400	23,400	3,600
Local Share, /yr.	29,200	2,600	400
Annual O & M Costs, /yr.	3,200	17,300	2,600
Total Annual Local Cost, /yr.	21,600	19,900	3,000
	24,800		
Total Concept Cost (Average Annual)	24,800	241,900	712,000

2-40

Community: Belmont

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$1,340,000 - 1,340,000 410,000 930,000 370,000 970,000 93,000 - 93,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	2-41 None
Total Concept Cost (Average Annual)	0	0	93,000

Community: Beverly

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$2,440,000 - 2,440,000 740,000 1,700,000 670,000 1,770,000 150,000 46,000 196,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 42
Total Concept Cost (Average Annual)	0	0	196,000

Community: Braintree

	Concept 1 1995A ~ No sewer	Concept 2 1995 ~ Min. Sewer	Concept 3 1995 ~ Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$330,000 - 330,000 100,000 230,000 90,000 240,000 21,000 169,000 190,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	2 - 43 None
Total Concept Cost (Average Annual)	0	0	\$190,000

Community: Boston

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 44
Total Concept Cost (Average Annual)	0	0	0

Community: Brookline	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	0	0

Community: Burlington

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
None	None	\$430,000 - 430,000 130,000 300,000 117,000 313,000 27,000 149,000 176,000
None	None	None
0	0	176,000

Sewerage Component:

Total Capital Cost

- Treatment Cost

- Conveyance Cost

Grant Eligible Cost

Grant Ineligible Cost

Federal/State Share

Local Share

Average Annual Local Share, /yr.

Annual O & M Costs, /yr.

Total Average Annual Cost, /yr.

Septage Component:

Average Total Annual Cost

Total Annual Capital Cost

Federal/State Share

Local Share, /yr.

Annual O & M Costs, /yr.

Total Annual Local Cost, /yr.

Total Concept Cost
(Average Annual)

Community: Cambridge

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
Sewerage Component: Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None
Septage Component: Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	0

Community: Canton	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$670,000 280,000 390,000 400,000 270,000 360,000 310,000 27,000 19,000 46,000	\$4,200,000 - 4,200,000 1,630,000 2,570,000 1,470,000 2,730,000 238,000 107,000 345,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	46,000	345,000

Community: Chelsea

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-49
Total Concept Cost (Average Annual)	0	0	0

Community: Cohasset

Community: Cohasset	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$4,280,000 2,380,000 1,900,000 2,960,000 1,320,000 2,660,000 1,620,000 141,000 20,000 161,000	I \$10,260,000 5,120,000 5,140,000 6,700,000 3,560,000 6,030,000 4,230,000 369,000 170,000 539,000 II \$7,720,000 5,250,000 2,470,000 6,000,000 1,720,000 5,400,000 2,320,000 202,000 145,000 347,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$34,300 20,600 18,500 2,100 13,700 15,800	27,900 16,700 15,000 1,700 11,200 12,900	\$9,600 5,800 5,200 600 3,800 4,400 2-50
Total Concept Cost (Average Annual)	15,800	173,900	543,400 351,400

Community: Concord	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$7,250,000 4,000,000 3,250,000 5,250,000 2,000,000 4,730,000 2,520,000 220,000 160,000 380,000	\$18,800,000 10,800,000 8,000,000 15,800,000 3,000,000 14,220,000 4,580,000 400,000 111,000 511,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$61,400 36,800 33,100 3,700 24,600 28,300	37,200 23,200 20,900 2,300 14,000 16,300	29,300 17,600 15,800 1,800 11,700 13,500
Total Concept Cost (Average Annual)	28,300	396,300	524,500

Community: Danvers	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$2,110,000 - 2,110,000 640,000 1,470,000 580,000 1,530,000 133,000 37,000 170,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 52
Total Concept Cost (Average Annual)	0	0	\$170,000

Community: Dedham

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$260,000 - 260,000 80,000 180,000 72,000 188,000 16,000 - 16,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 53
Total Concept Cost (Average Annual)	0	0	\$16,000

Community: Dover	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$29,100 17,500 15,800 1,700 11,600 13,300	\$29,100 17,500 15,800 1,700 11,600 13,300	\$29,100 17,500 15,800 1,700 11,600 13,300 2-54
Total Concept Cost (Average Annual)	\$13,300	\$13,300	\$13,300

Community: Duxbury

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer	
			I	II
<u>Sewerage Component:</u>				
Total Capital Cost	None	\$19,020,000	\$20,590,000	\$21,820,000
- Treatment Cost		11,700,000	11,220,000	12,800,000
- Conveyance Cost		7,320,000	9,370,000	9,020,000
Grant Eligible Cost		13,920,000	15,040,000	16,270,000
Grant Ineligible Cost		5,100,000	5,550,000	5,550,000
Federal/State Share		12,500,000	13,540,000	14,640,000
Local Share		6,520,000	7,050,000	7,180,000
Average Annual Local Share, /yr.		568,000	614,000	626,000
Annual O & M Costs, /yr.		240,000	152,500	180,000
Total Average Annual Cost, /yr.		808,000	766,500	806,000
<u>Septage Component:</u>				
Average Total Annual Cost	\$49,900	\$4,100	None	2 - 55
Total Annual Capital Cost	29,900	2,500		
Federal/State Share	26,900	2,300		
Local Share, /yr.	3,000	200		
Annual O & M Costs, /yr.	20,000	1,600		
Total Annual Local Cost, /yr.	23,000	1,800		
Total Concept Cost (Average Annual)	\$23,000	809,800	766,500	806,000

Community: Everett

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	0	0

Community: Framingham

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
Sewerage Component: Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$7,610,000 - 7,610,000 5,240,000 2,370,000 4,720,000 2,900,000 253,000 253,000 506,000
Septage Component: Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	\$506,000

Community: Franklin

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
Sewerage Component: Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$14,320,000 8,300,000 6,020,000 10,600,000 3,720,000 9,540,000 4,780,000 420,000 133,000 553,000
Septage Component: Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$46,900 28,100 25,300 2,800 18,800 21,600	2 - 58 5,500 3,300 3,000 300 2,200 2,500
Total Concept Cost (Average Annual)	\$21,600	\$139,200 \$555,500

Community: Hamilton

Community: Hamilton	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None		I \$14,650,000
- Treatment Cost		\$4,690,000	II \$10,350,000
- Conveyance Cost		2,700,000	-
Grant Eligible Cost		1,990,000	10,350,000
Grant Ineligible Cost		3,310,000	5,930,000
Federal/State Share		1,380,000	4,420,000
Local Share		2,980,000	5,340,000
Average Annual Local Share, /yr.		1,710,000	5,010,000
Annual O & M Costs, /yr.		149,000	437,000
Total Average Annual Cost, /yr.		108,000	19,000
		257,000	456,000
<u>Septage Component:</u>			
Average Total Annual Cost			21,300
Total Annual Capital Cost			12,800
Federal/State Share			11,500
Local Share, /yr.			1,300
Annual O & M Costs, /yr.			8,500
Total Annual Local Cost, /yr.			9,800

2 - 59

\$6,600

4,000

3,600

400

2,000

3,000

\$598,000

\$459,000

\$266,800

\$13,100

Community: Hanover

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer	
			I	II
Sewerage Component: Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$15,730,000 9,500,000 6,230,000 11,400,000 4,330,000 10,300,000 5,430,000 473,000 152,000 625,000	\$17,550,000 9,760,000 7,790,000 12,950,000 4,600,000 11,660,000 5,890,000 513,000 124,500 637,500	\$24,030,000 16,930,000 2,500,000 19,430,000 4,600,000 17,490,000 6,540,000 570,000 202,000 772,000
Septage Component: Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$36,200 21,700 9,500 2,200 14,500 16,700	\$2,300 1,400 1,300 100 900 1,000	0	2160
Total Concept Cost (Average Annual)	\$16,700	626,000	637,500	772,000

Community: Hingham

Community: Hingham	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$3,970,000 1,640,000 2,330,000 2,350,000 1,620,000 2,120,000 1,850,000 161,000 102,000 263,000	\$11,810,000 -\$13,410,000 4,020,000 11,810,000 9,390,000 7,040,000 6,370,000 3,630,000 6,340,000 8,180,000 7,070,000 712,000 259,000 394,000 971,000 1,010,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$98,000 58,800 52,900 5,900 39,200 45,100	72,300 43,400 39,100 4,300 28,900 33,200	0 2 - 61
Total Concept Cost (Average Annual)	\$45,100	\$296,200	\$971,000 \$1,010,000

Community: Holbrook

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	\$2,440,000	\$8,290,000
- Treatment Cost		-	-
- Conveyance Cost		2,440,000	8,290,000
Grant Eligible Cost		740,000	2,520,000
Grant Ineligible Cost		1,700,000	5,770,000
Federal/State Share		670,000	2,270,000
Local Share		1,770,000	6,020,000
Average Annual Local Share, /yr.		154,000	525,000
Annual O & M Costs, /yr.		114,000	348,000
Total Average Annual Cost, /yr.		268,000	873,000
<u>Septage Component:</u>			
Average Total Annual Cost	None	None	None
Total Annual Capital Cost			
Federal/State Share			
Local Share, /yr.			
Annual O & M Costs, /yr.			
Total Annual Local Cost, /yr.			
Total Concept Cost (Average Annual)	0	\$268,000	\$873,000

Community: Holliston

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$10,860,000 4,260,000 6,600,000 8,360,000 2,500,000 7,520,000 3,340,000 291,000 76,000 367,000	\$21,200,000 8,700,000 12,500,000 15,200,000 6,000,000 13,700,000 7,500,000 654,000 135,000 789,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$57,100 34,300 30,900 3,400 22,800 26,200	37,600 22,600 20,300 2,300 15,000 17,300	2-63 \$10,500 6,300 5,700 600 4,200 4,800
Total Concept Cost (Average Annual)	\$26,200	\$384,300	\$793,800

Community: Hopkinton	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$8,000,000 - 8,000,000 4,200,000 3,800,000 3,780,000 4,200,000 370,000 95,000 465,000	\$9,900,000 - 9,900,000 4,750,000 5,150,000 4,280,000 5,600,000 500,000 142,000 642,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$25,200 15,100 13,600 1,500 10,100 11,600	6,400 3,800 3,400 400 2,600 3,000	None 2 - 64
Total Concept Cost (Average Annual)	\$11,600	\$468,000	\$642,000

Community: Hudson

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /Yr. Annual O & M Costs, /Yr. Total Average Annual Cost, //Yr.	None	\$3,170,000 1,000,000 2,170,000 1,600,000 1,570,000 1,410,000 1,760,000 150,000 7,000 157,000	\$10,270,000 6,100,000 4,170,000 7,600,000 2,670,000 6,840,000 3,430,000 300,000 95,000 395,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /Yr. Annual O & M Costs, /Yr. Total Annual Local Cost, /Yr.	\$30,900 18,500 16,700 1,800 12,400 14,200	14,900 8,900 8,000 900 6,000 6,900	None 2 - 65
Total Concept Cost (Average Annual)	\$14,200	\$163,900	\$395,000

Community: Hull

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$1,650,000 1,110,000 540,000 1,270,000 380,000 1,140,000 510,000 44,000 - 44,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$460 280 250 30 180 210	\$460 280 250 30 180 210	None 2-66
Total Concept Cost (Average Annual)	\$210	\$210	\$44,000

Community: Lexington

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$3,510,000 - 3,510,000 1,070,000 2,440,000 960,000 2,550,000 222,000 - 222,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None 2-67
Total Concept Cost (Average Annual)	0	\$222,000

Community: Lincoln	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /Yr. Annual O & M Costs, /Yr. Total Average Annual Cost, /Yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /Yr. Annual O & M Costs, /Yr. Total Annual Local Cost, /Yr.	\$26,300 15,800 14,200 1,600 10,500 12,100	\$26,300 15,800 14,200 1,600 10,500 12,100	2 - 68 \$26,300 15,800 14,200 1,600 10,500 12,100
Total Concept Cost (Average Annual)	\$12,100	\$12,100	\$12,100

Community: Littleton

Community: Littleton	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$15,900,000 7,900,000 8,000,000 11,700,000 4,200,000 10,500,000 5,400,000 470,000 148,000 618,000	\$13,200,000 4,700,000 8,500,000 8,700,000 4,500,000 7,800,000 5,400,000 470,000 49,000 519,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$32,700 19,600 17,600 2,000 13,100 15,100	11,900 7,100 6,400 700 4,800 5,500	2 - 69 9,800 5,900 5,300 600 3,900 4,500
Total Concept Cost (Average Annual)	\$15,100	\$623,500	\$523,500

Community: Lynn	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$810,000 - 810,000 260,000 550,000 230,000 580,000 51,000 - 51,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	2-70 None
Total Concept Cost (Average Annual)	0	0	\$51,000

Community: Lynnfield

Sewerage Component:	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
Total Capital Cost	None		I II
- Treatment Cost		\$2,610,000	\$11,820,000
- Conveyance Cost		1,800,000	-
Grant Eligible Cost		810,000	11,820,000
Grant Ineligible Cost		2,050,000	6,240,000
Federal/State Share		560,000	5,580,000
Local Share		1,850,000	5,620,000
Average Annual Local Share, /yr.		760,000	6,200,000
Annual O & M Costs, /yr.		66,000	540,000
Total Average Annual Cost, /yr.		52,000	147,000
		118,000	687,000

Septage Component:

Average Total Annual Cost
Total Annual Capital Cost
Federal/State Share
Local Share, /yr.
Annual O & M Costs, /yr.
Total Annual Local Cost, /yr.

\$47,800
28,700
25,800
2,900
19,100
22,000

42,100
25,300
22,800
2,500
16,800
19,300

None

2 - 71

Total Concept Cost
(Average Annual)

\$22,000

\$137,300

\$687,000

\$856,000

Community: Malden	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$220,000 - 220,000 70,000 150,000 63,000 157,000 14,000 - 14,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-72
Total Concept Cost (Average Annual)	0	0	\$14,000

Community: Manchester

Community: Manchester	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, / yr.	None	\$450,000 220,000 230,000 290,000 160,000 260,000 190,000 17,000 19,000 36,000	I \$680,000 - 680,000 210,000 470,000 190,000 490,000 43,000 - 43,000 II \$2,470,000 1,780,000 690,000 1,990,000 480,000 1,790,000 680,000 59,000 N.A. 59,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$14,400 8,600 7,700 900 5,800 6,700	8,500 5,100 4,600 500 3,400 3,900	\$6,400 3,800 3,400 400 3,800 4,200 2-73
Total Concept Cost (Average Annual)	\$6,700	\$39,900	\$47,200 \$63,200

Community: Marblehead

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
Sewerage Component: Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$700,000 - 700,000 210,000 490,000 190,000 510,000 44,000 5,000 49,000
Septage Component: Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	\$49,000

Community: Marlborough

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$2,900,000 - 2,900,000 900,000 2,000,000 800,000 2,100,000 183,000 - 183,000	\$4,600,000 - 4,600,000 1,400,000 3,200,000 1,300,000 3,300,000 300,000 360,000 660,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$49,000 29,400 26,400 3,000 19,600 22,600	18,300 11,000 9,900 1,100 5,300 6,400	None 2 - 75
Total Concept Cost (Average Annual)	\$22,600	\$189,400	\$660,000

Community: Marshfield

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer	
			I	II
<u>Sewerage Component:</u>				
Total Capital Cost	None	None	\$13,230,000	\$14,690,000
- Treatment Cost			7,180,000	8,900,000
- Conveyance Cost			6,050,000	5,790,000
Grant Eligible Cost			9,650,000	11,110,000
Grant Ineligible Cost			3,580,000	3,580,000
Federal/State Share			8,690,000	10,000,000
Local Share			4,540,000	4,690,000
Average Annual Local Share, /yr.			396,000	409,000
Annual O & M Costs, /yr.			97,500	140,000
Total Average Annual Cost, /yr.			493,500	649,000
<u>Septage Component:</u>				
Average Total Annual Cost			\$12,600	2-76
Total Annual Capital Cost	\$93,100	\$50,100	7,600	
Federal/State Share	55,900	30,100	6,800	
Local Share, /yr.	50,300	27,100	800	
Annual O & M Costs, /yr.	5,600	3,000	5,000	
Total Annual Local Cost, /yr.	37,200	20,000	5,800	
	42,800	23,000		
Total Concept Cost (Average Annual)	\$42,800	23,000	499,300	654,800

Community: Maynard

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None \$520,000 - 520,000 40,000 480,000 36,000 480,000 42,000 - 42,000	\$4,050,000 3,100,000 950,000 3,400,000 650,000 3,100,000 950,000 83,000 32,000 115,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$8,000 4,800 4,300 500 3,200 3,700	None 3,700 2,200 2,000 200 1,500 1,700
Total Concept Cost (Average Annual)	\$3,700 \$43,700	\$115,000

Community: Medfield	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$200,000 - 200,000 - 200,000 - 200,000 17,000 - 17,000	\$700,000 - 700,000 - 700,000 - 700,000 61,000 52,000 113,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$42,100 25,300 22,800 2,500 16,800 19,300	41,200 24,700 22,200 2,500 16,500 19,000	2-78 36,400 21,800 19,600 2,200 14,600 16,800
Total Concept Cost (Average Annual)	\$19,300	\$36,000	\$129,800

Community: Medford

Community: Medford	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$65,000 - 65,000 20,000 45,000 18,000 47,000 4,100 - 4,100
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-79
Total Concept Cost (Average Annual)	0	0	\$4,100

Community: Medway

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	\$3,450,000	\$6,260,000
- Treatment Cost		90,000	2,300,000
- Conveyance Cost		3,360,000	3,960,000
Grant Eligible Cost		1,110,000	3,500,000
Grant Ineligible Cost		2,340,000	2,760,000
Federal/State Share		999,000	3,150,000
Local Share		2,460,000	3,110,000
Average Annual Local Share, /yr.		215,000	272,000
Annual O & M Costs, /yr.		9,000	31,000
Total Average Annual Cost, /yr.		224,000	302,000
<u>Septage Component:</u>			2 - 80
Average Total Annual Cost	\$32,000	13,300	9,200
Total Annual Capital Cost	19,200	8,000	5,500
Federal/State Share	17,300	7,200	5,000
Local Share, /yr.	1,900	800	500
Annual O & M Costs, /yr.	12,800	5,300	3,700
Total Annual Local Cost, /yr.	14,700	6,100	4,200
Total Concept Cost (Average Annual)	\$14,700	\$230,100	\$306,200

Community: Melrose

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$810,000 - 810,000 250,000 560,000 230,000 580,000 51,000 - 51,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-81
Total Concept Cost (Average Annual)	0	0	\$51,000

Community: Middleton

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer	
			I	II
<u>Sewerage Component:</u>	None	\$3,930,000 2,600,000 1,330,000 3,070,000 860,000 2,760,000 1,170,000 102,000 100,000 202,000	\$7,950,000 3,700,000 4,250,000 6,040,000 1,910,000 5,440,000 2,510,000 219,000 41,000 260,000	\$6,250,000 - 6,250,000 4,340,000 1,910,000 3,910,000 2,340,000 204,000 12,000 216,000
Total Capital Cost				
- Treatment Cost				
- Conveyance Cost				
Grant Eligible Cost				
Grant Ineligible Cost				
Federal/State Share				
Local Share				
Average Annual Local Share, /yr.				
Annual O & M Costs, /yr.				
Total Average Annual Cost, /yr.				
<u>Septage Component:</u>				
Average Total Annual Cost	\$20,800 12,500 11,300 1,200 8,300 9,500	12,800 7,700 6,900 800 5,100 5,900	\$8,200 4,900 4,400 500 3,300 3,800	2 1 8 2
Total Annual Capital Cost				
Federal/State Share				
Local Share, /yr.				
Annual O & M Costs, /yr.				
Total Annual Local Cost, /yr.				
Total Concept Cost (Average Annual)	\$9,500	\$207,900	\$263,800	\$219,800

Community: Milford

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$3,100,000 - 3,100,000 1,200,000 1,900,000 1,080,000 2,020,000 176,000 - 176,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$25,900 15,500 14,000 1,500 10,400 11,900	\$13,100 7,900 7,100 800 5,200 6,000	None 2-83
Total Concept Cost (Average Annual)	\$11,900	\$6,000	\$176,000

Community: Millis

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$4,720,000 1,600,000 3,120,000 3,250,000 1,470,000 2,930,000 1,800,000 157,000 52,000 209,000	\$10,600,000 4,700,000 5,900,000 8,000,000 2,600,000 7,200,000 3,400,000 296,000 96,000 392,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$21,500 12,900 11,600 1,300 8,600 9,900	12,800 7,700 6,900 800 5,100 5,900	2 - 84 6,000 1,800 1,600 200 1,200 1,400
Total Concept Cost (Average Annual)	\$9,900	\$214,900	\$393,400

Community: Milton

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$260,000 - 260,000 80,000 180,000 72,000 188,000 16,000 - 16,000	\$1,330,000 320,000 1,010,000 900,000 430,000 810,000 520,000 45,000 21,000 66,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$16,000	\$66,000

Community: Natick	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, / yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$130,000 - 130,000 40,000 90,000 36,000 94,000 8,000 - 8,000	\$2,180,000 - 2,180,000 660,000 1,520,000 590,000 1,590,000 139,000 - 139,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$8,000	\$139,000

Community: Nahant

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	0	0

Community: Needham

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$850,000 - 850,000 260,000 590,000 230,000 620,000 54,000 - 54,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 88
Total Concept Cost (Average Annual)	0	0	\$54,000

Community: Newton

Sewerage Component:	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Total Capital Cost</u> - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$70,000 - 70,000 20,000 50,000 18,000 52,000 4,500 - 4,500
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 89
Total Concept Cost (Average Annual)	0	0	\$4,500

Community: Norfolk

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	None	None
- Treatment Cost			
- Conveyance Cost			
Grant Eligible Cost			
Grant Ineligible Cost			
Federal/State Share			
Local Share			
Average Annual Local Share, / yr.			
Annual O & M Costs, /yr.			
Total Average Annual Cost, /yr.			
<u>Septage Component:</u>			
Average Total Annual Cost	\$78,400	\$28,400	\$28,400
Total Annual Capital Cost	17,000	17,000	17,000
Federal/State Share	15,300	15,300	15,300
Local Share, /yr.	1,700	1,700	1,700
Annual O & M Costs, /yr.	11,400	11,400	11,400
Total Annual Local Cost, /yr.	13,100	13,100	13,100
Total Concept Cost (Average Annual)	\$13,100	\$13,100	\$13,100

Community: North Reading

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$2,050,000 1,100,000 950,000 1,390,000 660,000 1,250,000 800,000 70,000 43,000 113,000	I \$11,500,000 4,800,000 6,700,000 8,920,000 2,580,000 8,030,000 3,470,000 302,000 68,000 370,000 II \$8,800,000 - 8,800,000 6,220,000 2,580,000 5,600,000 3,200,000 279,000 54,000 333,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$46,900 28,100 25,300 2,800 18,800 21,600	43,400 26,000 23,400 2,600 17,400 20,000	\$35,300 21,200 19,100 2,100 14,100 16,200 2 - 91
Total Concept Cost (Average Annual)	\$21,600	\$133,000	\$386,200 \$349,200

Community: Norwell

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer	
			I	II
<u>Sewerage Component:</u>				
Total Capital Cost	None	\$7,920,000	\$11,270,000	\$15,750,000
- Treatment Cost		3,500,000	5,460,000	10,370,000
- Conveyance Cost		4,420,000	5,810,000	5,380,000
Grant Eligible Cost		4,950,000	7,740,000	12,220,000
Grant Ineligible Cost		2,970,000	3,530,000	3,530,000
Federal/State Share		4,460,000	6,970,000	11,000,000
Local Share		3,460,000	4,300,000	4,750,000
Average Annual Local Share, /yr.		301,540	375,000	414,000
Annual O & M Costs, /yr.		103,000	68,400	124,000
Total Average Annual Cost, /yr.		404,500	443,400	538,000
<u>Septage Component:</u>				
Average Total Annual Cost	\$31,600	\$11,700	\$8,900	2192
Total Annual Capital Cost	19,000	7,000	5,300	
Federal/State Share	17,100	6,300	4,800	
Local Share, /yr.	1,900	700	500	
Annual O & M Costs, /yr.	12,600	4,700	3,600	
Total Annual Local Cost, /yr.	14,500	5,400	4,100	
Total Concept Cost (Average Annual)	\$14,500	409,900	447,500	542,000

Community: Norwood

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$910,000 - 910,000 280,000 630,000 250,000 660,000 58,000 67,000 125,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-93
Total Concept Cost (Average Annual)	0	0	\$125,000

Community: Peabody	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$1,790,000 - 1,790,000 540,000 1,250,000 490,000 1,300,000 110,000 74,000 184,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	0	\$184,000

Community: Quincy

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 95
Total Concept Cost (Average Annual)	0	0	0

Community: Randolph

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$130,000 - 130,000 20,000 110,000 18,000 112,000 10,000 24,000 34,000	\$2,210,000 - 2,210,000 670,000 1,540,000 600,000 1,610,000 140,000 72,000 212,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$34,000	\$212,000

Community: Reading

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$2,720,000 - 2,720,000 830,000 1,890,000 750,000 1,970,000 172,000 66,000 238,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	0	\$238,000

Community: Revere	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2 - 98
Total Concept Cost (Average Annual)	0	0	0

Community: Salem

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$1,220,000 - 1,220,000 370,000 850,000 330,000 890,000 78,000 20,000 98,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-99
Total Concept Cost (Average Annual)	0	0	\$98,000

Community: Saugus	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, / yr. Annual O & M Costs, / yr. Total Average Annual Cost, / yr.	None	\$1,010,000 - 1,010,000 580,000 430,000 520,000 490,000 43,000 - 43,000	\$5,060,000 - 5,060,000 1,820,000 3,240,000 1,640,000 3,420,000 298,000 - 298,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, / yr. Annual O & M Costs, / yr. Total Annual Local Cost, / yr.	\$39,800 23,900 21,500 2,400 15,900 18,300	26,100 15,700 14,100 1,600 10,400 12,000	None 2-100
Total Concept Cost (Average Annual)	\$18,300	\$55,000	\$298,000

Community: Rockland

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$12,820,000 9,000,000 3,820,000 10,160,000 2,660,000 9,140,000 3,680,000 320,700 150,000 470,700	\$23,930,000 17,800,000 6,130,000 19,770,000 4,160,000 17,790,000 6,140,000 535,000 262,000 797,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$43,700 26,200 23,600 2,600 17,500 20,100	\$12,100 7,300 6,600 700 4,800 5,500	None 2-101
Total Concept Cost (Average Annual)	\$20,100	476,200	797,000

Community: Scituate	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$2,480,000 1,400,000 1,080,000 1,730,000 750,000 1,560,000 920,000 80,000 50,000 130,000	\$12,610,000 6,720,000 5,890,000 9,140,000 3,470,000 8,230,000 4,400,000 383,000 84,000 467,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$54,500 32,700 29,400 3,300 21,800 25,100	\$46,500 27,900 25,100 2,800 18,600 21,400	2-102 \$24,000 14,400 13,000 1,400 9,600 11,000
Total Concept Cost (Average Annual)	\$25,100	151,400	478,000

Community: Sharon

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$232,000 122,000 110,000 152,000 80,000 137,000 95,000 8,000 3,000 11,000	\$390,000 280,000 110,000 310,000 80,000 280,000 110,000 10,000 19,000 29,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$60,400 36,200 32,600 3,600 24,200 27,800	59,800 35,900 32,300 3,600 23,900 27,500	2-103 58,600 35,200 31,700 3,500 23,400 26,900
Total Concept Cost (Average Annual)	\$27,800	\$38,500	\$55,900

Community: Sherborn	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$23,100 13,900 12,500 1,400 9,200 10,600	\$23,100 13,900 12,500 1,400 9,200 10,600	\$23,100 13,900 12,500 1,400 9,200 10,600
Total Concept Cost (Average Annual)	\$10,600	\$10,600	\$10,600

Community: Southborough

Community: Southborough	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$9,900,000 - 9,900,000 4,900,000 5,000,000 4,400,000 5,500,000 480,000 72,000 552,000	\$10,700,000 - 10,700,000 5,200,000 5,500,000 4,700,000 6,000,000 520,000 126,000 646,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$26,100 15,700 14,100 1,600 10,400 12,000	3,000 1,800 1,600 200 1,200 1,400	2-105 None
Total Concept Cost (Average Annual)	\$12,000	\$553,400	\$646,000

Community: Somerville	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-106
Total Concept Cost (Average Annual)	0	0	0

Community: Stoneham

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$390,000 - 390,000 120,000 270,000 108,000 282,000 25,000 - 25,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	\$25,000

Community: Stoughton

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$420,000 - 420,000 130,000 290,000 120,000 300,000 26,000 - 26,000	\$7,730,000 160,000 7,570,000 3,160,000 4,570,000 2,840,000 4,890,000 426,000 234,000 660,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$26,000	\$660,000

Community: Stow

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$5,700,000 3,200,000 2,500,000 3,600,000 2,100,000 3,200,000 1,500,000 131,000 23,000 153,000	\$4,400,000 1,900,000 2,500,000 2,300,000 2,100,000 2,100,000 2,300,000 200,000 32,000 232,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$30,700 18,400 16,600 1,800 12,300 14,100	18,500 11,100 10,000 1,100 7,400 8,500	2-109 18,500 11,100 10,000 1,100 7,400 8,500
Total Concept Cost (Average Annual)	\$14,100	\$161,500	\$240,500

Community: Sudbury

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$49,200 29,500 26,600 2,900 19,700 22,600	\$49,200 29,500 26,600 2,900 19,700 22,600	\$49,200 29,500 26,600 2,900 19,700 22,600 2-110
Total Concept Cost (Average Annual)	\$22,600	\$22,600	\$22,600

Community: Swampscott

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, / yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$540,000 - 540,000 160,000 380,000 140,000 400,000 35,000 - 35,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	2-111 None
Total Concept Cost (Average Annual)	0	0	\$35,000

Community: Topsfield	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$26,600 16,000 14,400 1,600 10,600 12,200	\$26,600 16,000 14,400 1,600 10,600 12,200	\$26,600 16,000 14,400 1,600 10,600 12,200
Total Concept Cost (Average Annual)	\$12,200	\$12,200	\$12,200

2-1112

Community: Wakefield

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$600,000 - 600,000 180,000 420,000 160,000 440,000 38,000 - 38,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	\$38,000

2-113

Community: Walpole	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$40,000 - 40,000 10,000 30,000 9,000 31,000 2,700 - 2,700	\$10,210,000 - 10,210,000 7,280,000 2,930,000 6,550,000 3,660,000 319,000 125,000 444,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$2,700	\$444,000

Community: Waltham

Sewerage Component:	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Total Capital Cost</u> - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$850,000 - 850,000 260,000 590,000 230,000 620,000 54,000 - 54,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	2-115 None
Total Concept Cost (Average Annual)	0	0	\$54,000

Community: Watertown

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	0

2-116

Community: Wayland	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$2,000,000 - 2,000,000 300,000 1,700,000 270,000 1,730,000 151,000 14,000 165,000	\$4,800,000 - 4,800,000 1,200,000 3,600,000 1,100,000 3,700,000 322,000 62,000 384,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$37,300 22,300 20,100 2,200 15,000 17,200	33,900 20,300 18,300 2,000 13,600 15,600	2-117 22,400 13,400 12,100 1,300 9,000 10,300
Total Concept Cost (Average Annual)	\$17,200	\$180,600	\$394,300

Community: Wellesley

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$300,000 - 300,000 90,000 210,000 81,000 219,000 19,000 - 19,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	\$19,000

Community: Wenham

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$140,000 - 140,000 40,000 100,000 36,000 104,000 9,000 500 9,500
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	\$15,300 9,200 8,300 900 6,100 7,000	14,900 8,900 8,000 900 6,000 6,900
Total Concept Cost (Average Annual)	\$7,000	\$16,400

Community: Weston

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	None	\$430,000
- Treatment Cost			-
- Conveyance Cost			430,000
Grant Eligible Cost			130,000
Grant Ineligible Cost			300,000
Federal/State Share			120,000
Local Share			310,000
Average Annual Local Share, /yr.			27,000
Annual O & M Costs, /yr.			-
Total Average Annual Cost, /yr.			27,000
<u>Septage Component:</u>			2-120
Average Total Annual Cost	\$46,000	\$46,000	45,800
Total Annual Capital Cost	27,600	27,600	27,500
Federal/State Share	24,800	24,800	24,700
Local Share, /yr.	2,800	2,800	2,800
Annual O & M Costs, /yr.	18,400	18,400	18,300
Total Annual Local Cost, /yr.	21,200	21,200	21,100
Total Concept Cost (Average Annual)	\$21,200	\$21,200	\$48,100

Community: Westwood

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	\$480,000 - 480,000 150,000 330,000 135,000 345,000 30,000 - 30,000	\$3,340,000 - 3,340,000 1,020,000 2,320,000 920,000 2,420,000 210,000 47,000 257,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None
Total Concept Cost (Average Annual)	0	\$30,000	\$257,000

Community: Weymouth

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u>			
Total Capital Cost	None	\$1,040,000	\$4,860,000
- Treatment Cost		-	-
- Conveyance Cost		1,040,000	4,860,000
Grant Eligible Cost		320,000	1,480,000
Grant Ineligible Cost		720,000	3,380,000
Federal/State Share		290,000	1,330,000
Local Share		750,000	3,530,000
Average Annual Local Share, /yr.		65,000	308,000
Annual O & M Costs, /yr.		42,000	251,000
Total Average Annual Cost, /yr.		107,000	559,000
<u>Septage Component:</u>			
Average Total Annual Cost	None	None	None
Total Annual Capital Cost			
Federal/State Share			
Local Share, /yr.			
Annual O & M Costs, /yr.			
Total Annual Local Cost, /yr.			
Total Concept Cost (Average Annual)	0	\$107,000	\$559,000

Community: Wilmington

	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$7,800,000 - 7,800,000 2,370,000 5,430,000 2,130,000 5,670,000 494,000 222,000 716,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-123
Total Concept Cost (Average Annual)	0	0	\$716,000

Community: Winchester	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$480,000 - 480,000 150,000 330,000 135,000 345,000 30,000 - 30,000
<u>Septage Component:</u> Average, Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, / yr.	None	None	None 2-124
Total Concept Cost (Average Annual)	0	0	\$30,000

Community: Winthrop

Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Sewerage Component:</u> Total Capital Cost - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None
Total Concept Cost (Average Annual)	0	0

Community: Woburn

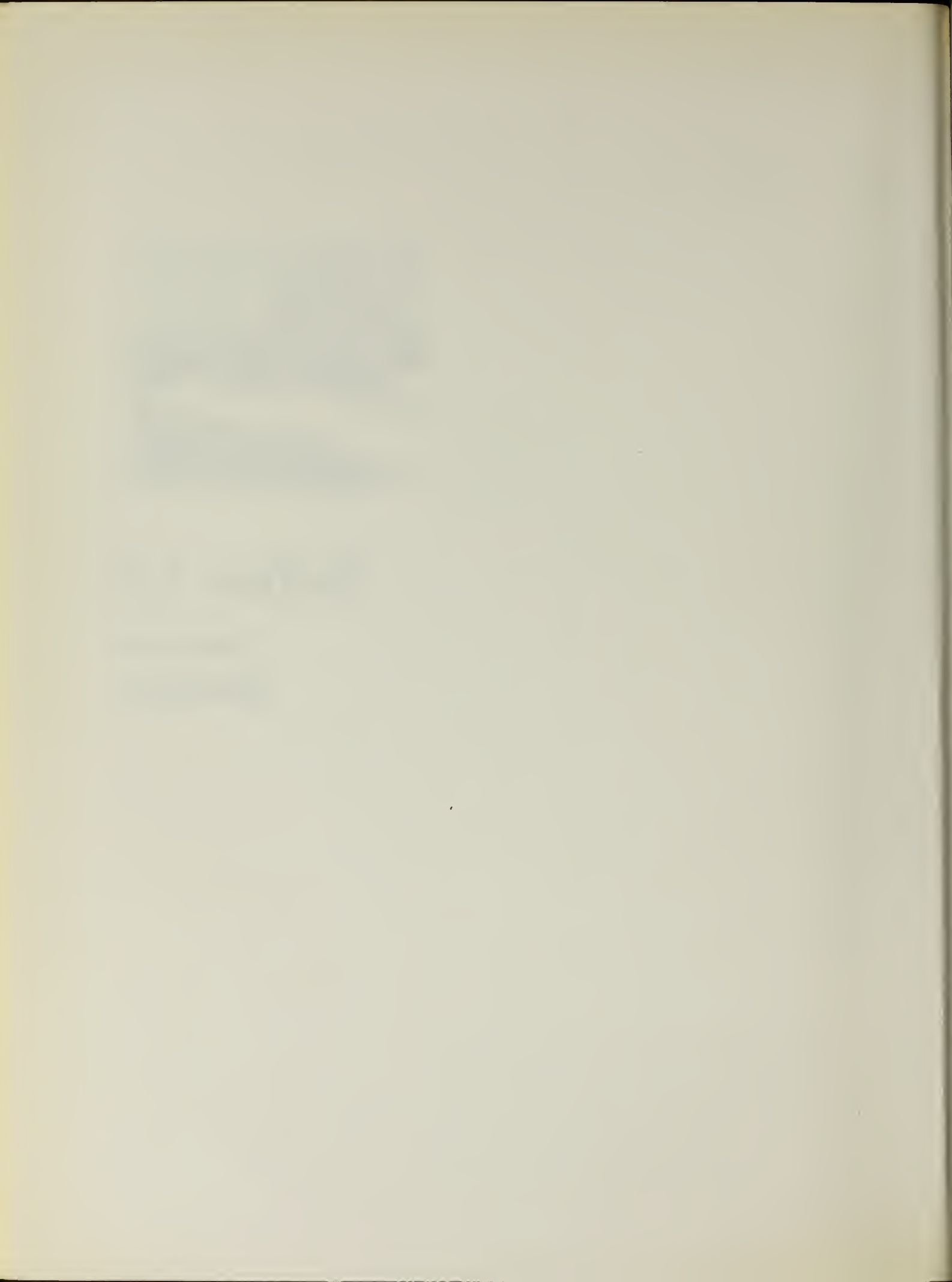
Sewerage Component:	Concept 1 1995A - No sewer	Concept 2 1995 - Min. Sewer	Concept 3 1995 - Max. Sewer
<u>Total Capital Cost</u> - Treatment Cost - Conveyance Cost Grant Eligible Cost Grant Ineligible Cost Federal/State Share Local Share Average Annual Local Share, /yr. Annual O & M Costs, /yr. Total Average Annual Cost, /yr.	None	None	\$1,520,000 - 1,520,000 460,000 1,060,000 410,000 1,110,000 97,000 - 97,000
<u>Septage Component:</u> Average Total Annual Cost Total Annual Capital Cost Federal/State Share Local Share, /yr. Annual O & M Costs, /yr. Total Annual Local Cost, /yr.	None	None	None 2-126
Total Concept Cost (Average Annual)	0	0	\$97,000

	Concept 1 1995A ~ No sewer	Concept 2 1995 ~ Min. Sewer	Concept 3 1995 ~ Max. Sewer
Sewerage Component:			
Total Capital Cost	None	\$3,970,000	\$9,040,000
- Treatment Cost		1,150,000	3,800,000
- Conveyance Cost		2,820,000	5,240,000
Grant Eligible Cost		3,330,000	7,580,000
Grant Ineligible Cost		640,000	1,460,000
Federal/State Share		3,000,000	6,820,000
Local Share		970,000	2,220,000
Average Annual Local Share, /yr.		74,000	193,000
Annual O & M Costs, / yr.		11,000	71,000
Total Average Annual Cost, / yr.		85,000	264,000
Septage Component:			2-127
Average Total Annual Cost	\$44,000	38,200	31,100
Total Annual Capital Cost	26,400	22,900	18,700
Federal/State Share	23,800	20,600	16,800
Local Share, /yr.	2,600	2,300	1,900
Annual O & M Costs, /yr.	17,600	15,300	12,400
Total Annual Local Cost, /yr.	20,200	17,600	14,300
Total Concept Cost (Average Annual)	\$20,200	\$102,600	\$278,300



Section 2.3

Industrial Discharges



PART II, SECTION 3

INDUSTRIAL DISCHARGES

In this section you will find:

- I. A description of the scope of the industrial study.
- II. A list of the major study findings.
- III. A list of recommendations for regulation of industrial dischargers.
- IV. The determination of significant industrial dischargers in the 208 area.
- V. A recommended Sewer Use Ordinance and Drain Layers Manual
- VI. Pretreatment guidelines for the tanning industry.
- VII. A discussion of key financial and management factors.

In addition the following means of implementation are included at the end of this section.

- A proposed Model Sewer Use Law.
- A sample Drain Layers Manual.

I. THE STUDY SCOPE

As part of the 208 program, a study* was conducted to assess the industrial wastewater situation in part of the MAPC planning area. The main purpose of this study was to develop information and to provide outputs that would permit the MAPC to fulfill its areawide wastewater management responsibilities with regard to industrial pollution sources. To achieve this objective, the following activities were undertaken:

- 1) Review and analysis of existing and obtainable data involving industries within the 208 study area;
- 2) Listing of all industries discharging to a watercourse;
- 3) Listing of all possible significant industries located in communities not served by the MDC;
- 4) Investigation and analysis of possible significant industrial, commercial and private institutional establishments to determine which of these will have a significant impact on the study area; and

* Report to Metropolitan Area Planning Council on 208 Areawide Industrial Discharge Project, Metcalf & Eddy, Inc., October, 1977.

- 5) Development of a method for continually updating information on all possible significant industries.

To aid in the investigation and analysis of possible significant industries, the use of questionnaires, sampling and monitoring and case history programs was evaluated. A limited questionnaire program was first undertaken and an analysis of the findings of this program was used to determine the applicability of undertaking sampling and monitoring and case history programs.

In addition, a model sewer use ordinance was developed to guide communities in establishing appropriate sewer use ordinances compatible with their specific needs. In conjunction with the sewer use ordinances, a sample drain layers manual is presented. This manual establishes the allowable methods and materials for the construction of sewer connections.

Finally, pretreatment guidelines for the tanning industry were developed based on a review of the industry's wastewater characteristics, existing pretreatment facilities, and the proposed type of wastewater treatment (SESD).

The scope of the study includes all those industries within the MAPC area that discharge to watercourses, and those industries that discharge to wastewater collection systems outside of the area served by the Metropolitan District Commission (MDC). A list of these communities follows.

TABLE 3-1
MAPC 208 STUDY AREA COMMUNITIES
OUTSIDE THE MDC SEWER SERVICE AREA

Acton	Lynn	Peabody
Bellingham	Lynnfield	Rockland
Beverly	Manchester	Salem
Cohasset	Marblehead	Saugus
Concord	Marlborough	Scituate
Danvers	Marshfield	Sharon
Dover	Maynard	Sherborn
Duxbury	Medfield	Southborough
Franklin	Medway	Stow
Hamilton	Middleton	Sudbury
Hanover	Milford	Swampscott
Holliston	Millis	Topsfield
Hopkinton	Nahant	Wayland
Hudson	Norfolk	Wenham
Hull	North Reading	Weston
Lincoln	Norwell	Wrentham
Littleton		

II. STUDY FINDINGS

A total of 201 industries were identified as significant industries following the questionnaire and telephone survey programs. Of these, 150 industries were identified by NPDES permit application.

Further analysis of the information in the data base and the results of the questionnaire program indicate the following:

- 1) With the exception of the tanning industry, possible significant industrial activities are geographically scattered throughout the MAPC 208 planning area. The tanning industry is essentially located in the Peabody-Salem area.
- 2) Significant industries that discharge to watercourses are widely scattered throughout the MAPC 208 planning area.
- 3) Significant industries that do not discharge to watercourses are almost entirely located in sewered areas, implying very little on-lot disposal of significant industrial wastes.
- 4) In unsewered areas, those industries that have the greatest potential for discharging possible significant discharges are engaged in the following SIC code activities:
 - a) SIC Code 35 - Machinery, except Electrical; e.g., 3541, Machine tools, metal cutting types, and 3573, Electronic Computing Equipment, etc.
 - b) SIC Code 36 - Electrical Machinery; e.g., 3679, Electronic Components, not elsewhere classified, etc.
 - c) SIC Code 34 - Fabricated Metal; e.g., 3471, Electroplating, Plating, Polishing, Anodizing and Coloring, and 3494, Valves and Pipe Fittings, except Plumber's Brass Goods, etc.
 - d) SIC Code 38 - Instruments; e.g., 3811, Engineering, Laboratory, Scientific, and Research Instruments and Associated Equipment, and 3843, Dental Equipment and Supplies, etc.
- 5) In sewered areas, from a potential pollution standpoint, major SIC code activities are:
 - a) SIC Code 31 - Leather and Leather Products; e.g., 3111, Leather Tanning and Finishing, etc.
 - b) SIC Code 36 - Electrical Machinery; e.g., 3641, Electric Lamps, and 3679, Electronic Components, not elsewhere classified, etc.

- c) SIC Code 28 - Chemical; e.g., 2821, Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers, and 2891, Adhesives and Sealants, etc.
 - d) SIC Code 34 - Fabricated Metal; e.g., 3471, Electroplating, Plating, Polishing, Anodizing and Coloring, and 3494, Valves and Pipe Fittings, except Plumber's Brass Goods, etc.
 - e) SIC Code 20 - Food; e.g., 2011, Meat Packaging Plants, and 2051, Bread and other Bakery Products, except Cookies and Crackers, etc.
- 6) A review of the information in the data base, supplemented by technical information from various sources, indicates that smaller industries within the following SIC code activities either have no process waste discharge, have a compatible discharge of low volume, or recycle their process wastes. The latter is especially true of the machinery industry which normally recycles its spent oil solutions.
- a) 3544 - Special Dies and Tools;
 - b) 3559 - Special Industry Machinery;
 - c) 3599 - Machinery, except Electrical; and
 - d) 3732 - Boat Building and Repairing.
- 7) Most of the chemical firms are small (employing less than 50 people), and they produce a wide variety of products. Little information exists on the characteristics of their wastewaters.
- 8) The primary significant discharge within the SIC Codes 34 - Fabricated Metal; 35 - Machinery, except Electrical; and 36 - Electrical Machinery is derived from a secondary activity: the cleaning and plating of metals.
- 9) Leather tanning and finishing industries are engaged in tanning, retanning, or finishing leather products. The data indicates that the discharge from the tanning industry has stronger characteristics than that discharged by the retanning industry.
- 10) There is a need for establishing pretreatment guidelines for the tanning industry since this industrial activity is one of the major sources of industrial waste discharges within the MAPC.
- 11) Given the normal number of laundromats that can be economically supported by a community, individually or as a group, they are not significant dischargers in sewered areas.

- 12) Wastes discharged by restaurants are compatible with biological treatment. However, the available data indicates that concentrations of BOD (Biochemical Oxygen Demand) and SS (Suspended Solids) are somewhat higher than one would find in domestic wastewater.
- 13) Hospitals, depending on size, can be significant dischargers since the larger hospitals discharge in excess of 50,000 gallons per day. The normal waste discharged by hospitals is compatible with biological wastewater treatment processes.
- 14) Information concerning photo-finishing shops that process film is insufficient to give them a final classification. Since they do have the potential for discharging wastewaters that may contain silver or ferro cyanide, they have been retained in the possible significant classification.
- 15) Information available from local industrial sources in many cases is insufficient to define the characteristics of the wastewater discharged by these industries.
- 16) Local pretreatment practices are not sophisticated enough and do not have a sufficiently widespread application to warrant case history development.
- 17) There is a need for additional sampling and monitoring in order to fully identify significant industries within the MAPC 208 study area.

III. RECOMMENDATIONS

Following the review of the report submitted by Metcalf & Eddy, recommendations for the areawide regulation of industrial dischargers were developed. These are:

- 1) The Massachusetts Division of Water Pollution Control (MDWPC) should be the agency to establish and maintain a computerized industrial data base. This data base should be expanded to encompass all of the industrial dischargers in the Commonwealth. The MDWPC has the mechanisms available to continually update the data base. This information is readily obtainable by the MDWPC through the 303(e) basin planning process, the 201 facilities plan review process, the NPDES permit application and compliance monitoring program, and the industrial sewer connection permit applications. The information in the data base could assist the MDWPC in establishing and maintaining the stream segment load allocations required in the 303(e) basin plans. The data base would be useful to sewer communities in establishing industrial cost recovery and pretreatment requirements. Savings could be realized through reduced consultant fees and the time to conduct the inventory and evaluation.

- 2) The MDWPC should establish sampling and monitoring programs to complete the data base for the significant and possible significant industries. If possible, sampling and monitoring of certain service industries and the small possible significant industries should be initiated. The lack of information concerning these industrial categories makes regulation difficult, if not impossible.
- 3) Sewered communities should conduct extensive industrial discharge surveys to identify all contributing industries. This information would help complete the data base, as well as providing the community with the information needed to establish pretreatment guidelines and industrial cost recovery programs. This has been completed for the SESD member communities and should be near completion for MDC member communities.
- 4) Sewered communities should, if they haven't already, adopt a sewer use ordinance similar to the model ordinance presented in this report. In addition, a drain layer's manual should be adopted to standardize the materials and construction practices used in sewer connections.
- 5)
 - a. Unsewered communities should attempt to sample and monitor those industrial discharges to the ground from industries that have the potential of discharging toxic materials. This is especially important when an industrial discharge to the ground is near a public water supply. The sampling/monitoring results should be the basis for Board of Health action under the Environmental Code and for additional enforcement actions by DEQE and MDWPC.
 - b. The Massachusetts Department of Environmental Quality Engineering (DEQE) should assume the regulation of all industrial discharges (excluding sanitary wastes) to the ground. The existing situation places the regulation of ground discharges of less than 15,000 gpd in the hands of the local Board of Health, which may or may not have the required expertise to monitor these discharges. At the very least, the regulation of industrial discharges to ground by the DEQE would insure some consistency. In addition, the information gathered by the DEQE would be readily available for inclusion in the computerized data base.
- 6) The SESD should attempt to enforce the pretreatment requirements for the leather tanning industry. These requirements should be modified with changes in the treatment process. A wastewater monitoring and metering program should also be established for better control and operation at the treatment plant.

IV. DETERMINATION OF SIGNIFICANT INDUSTRIES

A. Introduction

The primary purpose of this investigation was to identify the significant industries within the study area. A three-phase process was used to proceed from an inventory of all industries to the identification of the significant industries. The initial phase consisted of applying general criteria to determine which industries are possible significant. The industries identified in this phase have either a discharge to a waterbody or are engaged in an activity which may have a significant discharge. A total of 1874 industries were identified in this phase. The second phase consisted of a screening process that involved reviewing the data base and conducting a telephone survey. This phase was an attempt to eliminate the non-significant industries using information not available in the first phase. Following the screening process, 362 industries remained as possible significant. The final phase consisted of applying the definition of significant industries to the 362 remaining possible significant industries. The definition of significant industries, as established in Environmental Protection Agency (EPA) guidelines, consists of industries fulfilling one of the following criteria:

- 1) All known discharges to a surface waterbody;
- 2) All known discharges to a public sewer in the amount greater than 50,000 gpd (gallons per day) or 5 percent of the total flow at the treatment plant, whichever is less; or
- 3) All known toxic discharges.

A total of 201 industries were identified as significant industries.

A secondary purpose of this investigation was to determine what information was needed to complete the data base. A survey of the available literature indicated that much information is still needed, especially regarding the waste characteristics of the smaller companies. Much of this information is available only through systematic sampling and monitoring programs. The high cost of these programs gives them a lower priority among the local, state and federal authorities. These small companies may have very significant discharges, but without adequate data, proper regulation is difficult.

B. Data Base Development

1. Possible Significant Industries. The first step in the development of the data base was to identify those industries that have the potential of discharging wastes which may be considered possible significant with respect to the environmental issues in the MAPC 208 study area. To achieve the above, it was necessary to establish criteria for identifying possible significant industries. For this initial identification process, possible significant industries were defined: a) as all industries that have applied for National Pollutant Discharge Elimination System (NPDES) permits and b) as all industries outside the MDC sewer service area which come under the Standard Industrial Classification (SIC) codes listed in Table 3-2. Certain service industries have been included (i.e. hospitals, restaurants, photo-finishers and laundromats).

TABLE 3-2 INDUSTRIAL CLASSIFICATIONS INCLUDED IN THE IDENTIFICATION PROCESS

Industrial category	Industrial classifications included (SIC codes) ⁽¹⁾
Normally very wet industries or those containing toxic wastes	20, 22, 261, 262, 263, 2641, 2645, 2649, 266, 2711, 2753, 28, 291, 295, 2992, 301, 3021, 303, 311, 331, 333, 334, 341, 342, 345, 346, 347, 349, 35, 36, 37, 38, and 39.
Normally wet industries ² , however, requiring employment greater than 100 to be significant	264 (except 2641, 2645 and 2649), 265, 2999, 30 (except 301, 302 and 303), 324, 329, 335, and 336.
Normally dry industries ² requiring employment greater than 250 to be significant	21, 23, 24, 25, 27 (except 2711 and 2753), 302 (except 3021), 31 (except 311), 32 (except 324 and 329), 332, 339, 343, 344, and 348.
Service-type industries	806, 5812, 7215, and 7395.

1. For definitions of codes, see Standard Industrial Classification Manual, Executive Office of the President, Office of Management and Budget, 1972. (see appended section on SIC codes)
2. Since the objective of the identification process was to provide a complete listing of all possible significant industries, industries within the Wet and Dry classifications were identified regardless of employment.

2. Source of Information. The identification of possible significant industries requires that all available information be considered. The two most comprehensive data sources are regulatory agency files on industrial dischargers, and industrial employment and type of industry data provided by state agencies and industrial directories. Under Federal law, industrial dischargers to waterways must secure a NPDES permit. The EPA, Region I maintains a computerized data base system that identifies all industries that have applied for permits. This computerized data base was used as a major source in identifying industries that discharge to natural water-courses. In addition, river basin water quality management plans, prepared by the Massachusetts Division of Water Pollution Control (MDWPC) under Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), was reviewed and agency staff were interviewed for the purpose of identifying additional industrial dischargers.

Identification of industries within applicable SIC codes, shown in Table 3-2 was made from numerous sources. The Massachusetts Industrial Directory (1974-1975 edition) and the Directory of New England Manufacturers (1974 and 1976 editions) were reviewed to determine industries within each applicable SIC code. These sources provided data concerning name and location of industry, approximate employment figures, product and SIC code activity. Previously completed areawide industrial waste surveys such as the EMMA industrial waste survey* and the SESD industrial waste survey** were used as identification sources. They supplied information concerning the quantity and type of wastes. Follow-up analytical work and sampling and monitoring programs undertaken in these studies provided information on the characteristics of the wastes. Engineering reports submitted to MDWPC were reviewed to identify possible significant industries. In some instances, these reports identified industries without a defined code activity. These industries were carried in an unknown SIC code classification for future evaluation.

Identification of service industries was secured from various sources of information. Hospitals were listed from an American Hospital Guide to the Health Care Field.*** Due to a lack of inventorial sources, all other service industries were identified from the yellow pages of the telephone book covering individual municipalities. However, this source provides only the name and location and did not allow a determination of significance.

3. Data Base Format. To facilitate the entry and analysis of data, the data base system was arranged into four categories:

- 1) Industries in sewerage areas outside MDC sewer service area.
- 2) Industries in unsewered areas outside MDC sewer service area.

* "Eastern Massachusetts Metropolitan Area Wastewater Management Study" Industrial Waste Survey, Metcalf & Eddy, Inc., March, 1975.

** "South Essex Sewerage District Industrial Waste Survey", Metcalf & Eddy, Inc., 1973.

*** "Guide to the Health Care Field", American Hospital Association, 1975.

- 3) Industries with NPDES permits in MDC sewer service area.
- 4) Industries with NPDES permits outside MDC sewer service area.

Within each category, identified industries were entered by the municipality in which they are located. Sewered areas were defined as those municipalities that provide sewer service to 20 percent or more of their population.

The data base format is made up of a group of data logs entered into a table composed of three sheets. The format is designed to provide a listing of each identified industry, the type of industry, water supply source, water consumption, and the quantity, characteristics and location of discharged wastes.

4. Data Base Review. Information from the previously described sources was compiled in the data base resulting in a total of 1,874 industries identified as possible significant. Of these, 222 have applied for NPDES permits and 1,652 were engaged in applicable SIC code activities.

Of the 1,652 industries identified by SIC classifications, 993 were in the Very Wet category, 84 were in the Wet category, 459 were in the Dry category, and 96 were classified as Service industries. Twenty industries were classified as SIC code unknown and held for further identification.

Review of the information available for industries with NPDES applications indicates that almost complete information is available for them. This information gives the quantity and characteristics of process wastes discharged to watercourses.

Review of the data covering other industrial dischargers located in sewered and unsewered areas indicated that some 25 percent had some sort of data in addition to name, address and product. Further inspection showed most of the data were available on the larger industries and consisted of quantity rather than quality data.

C. Significant Industries

1. Methodology. The 1,874 industries identified as possible significant through SIC classification and NPDES permit applications were then screened to eliminate those industries with discharges to a sewer system of other than process and cooling waters, and to proceed with the determination of significant industrial discharges. The screening process was undertaken in four steps. First, a selective survey was undertaken of the identified possible significant industries to screen out those industries that discharge only sanitary wastes. Such industries are non-significant for the purposes of this investigation. Second, a screening process was conducted on those industries that had applied for NPDES permits to determine issued, unissued, and no permit required industries. Industries with issued and unissued permits are classified as significant industries in accordance with the definition of a significant industry. No permit required industries were screened to determine if any process waste or cooling water was discharged

to a municipal sewer system. Third, a telephone survey was initiated to further evaluate the possible significant industries within a particular SIC code and to fill in some of the missing data. The telephone survey program covered the service industries and those manufacturing industries located in sewered areas which fall under the Very Wet, Wet and Dry categories (see Table 3-2). Within the Wet and Dry categories, however, the survey was limited to those industries that met the respective employment criteria of 250 and 100 or more employees. A questionnaire form was prepared for each SIC code activity to aid in the telephone survey. It should be noted that in this screening process, each industry is initially identified in the possible significant classification and then reclassified as a result of the telephone survey or other information indicating that it is non-significant. Fourth, the remaining possible significant industries were reviewed to determine significant industries using the definition of significant industries.

2. Screening of NPDES Industries. Of the 222 identified industries with NPDES permit applications, a total of 150 have been issued permits or are in the process of securing permits and, therefore, are classified as significant industries. Of the 150 significant industries in this category, 102 are located within the MDC sewer service area and 40 are located outside the MDC area. These are listed in Tables 3-3 and 3-4, respectively.

Sixty-seven of the 222 possible significant NPDES industries are no permit required (NPR) industries. Forty-three of these are located outside the MDC area. Of the 43, 24 industries discharge solely to a municipal sewer system and all are being retained in the data base for future evaluation since they may have possible significant discharges. The information available indicates that four of the NPR industries may discharge small quantities of cooling water to surface waters. These industries are being held for future evaluation.

3. Screening of Service Industries. The screening of identified service industries represented a particular problem because they are numerous and their waste characteristics are not readily identifiable from available resource material. For this reason, a selective telephone survey was undertaken. Where the survey indicated that large service industries were non-significant dischargers, the entire service industry was classified accordingly.

Service industries are summarized in Tables 3-5 and 3-6. A brief description of the rationale for assigning the indicated classifications follows.

The wastes discharged by restaurants are compatible with biological treatment and are not toxic. Data were available on the characteristics of wastes discharged from one restaurant in the area. This data indicated that the concentration of BOD (Biological Oxygen Demand) and SS (Suspended Solids) was somewhat higher than one would find in domestic wastewaters. Since the regulating authorities may, if the administrative problems are not too great, wish to surcharge restaurants for the higher BOD and SS loads that they may contribute to the treatment systems, they have been retained as possible significant.

Table (3-3) - Significant Industries, as Identified by NPDES
Permit Application, Within the MDC Sewer Service Area

Name of Firm	Location	Receiving Waters	Permit Status
White Fuel Corp.	Arlington	Mystic River	Issued
Ashland Sand & Concrete	Ashland	Sudbury River	Issued
Fenwal, Inc.	Ashland	Cold Spring Brook	Issued
General Electric	Ashland	Sudbury River	Issued
Raytheon Co.	Bedford	Elm Brook	Unissued
Millipore Corp.	Bedford	Vine Brook	Unissued
Belmont Springs Water Co.	Belmont	Charles River	Issued
American Sugar Co.	Boston	Mystic River	Issued
Barnstead Co.	Boston	Charles River	Issued
Distrigas of Mass. Co.	Boston	Mystic R. Channel	Issued
Great A & P Tea Co.	Boston	Boston Harbor	Issued
Honeywell Info. Systems	Boston	Charles River	Unissued
National Lobster Co.	Boston	Boston Harbor	Unissued
Schraff Candy Co.	Boston	Mystic River	Issued
Westinghouse Electric	Boston	Neponset River	Issued
White Fuel Corp.	Boston	Boston Harbor	Issued
Tilesen & Hollingsworth	Boston	Neponset River	Unissued
Boston Sand & Gravel	Boston	Charles River	Issued
Revere Sugar Refinery	Boston	Mystic River	Issued
U.S. Gypsum	Boston	Mystic River	Issued
N.E. Cut Stone	Boston	Neponset River	Unissued
Bethlehem Steel Corp.	Boston	Boston Harbor	Issued
Hess Oil & Chemical	Boston	Chelsea River	Issued
Mobil Oil Co.	Boston	Chelsea River	Issued
Magnesium Casting Co.	Boston	Neponset River	Issued

* As of March 16, 1978

Table 3-3 (cont.)

3-13

Name of Firm	Location	Receiving Waters	Permit Status
Boston Edison - L. St.	Boston	Boston Harbor	Issued
Gillette Co.	Boston	Boston Harbor	Issued
MBTA - S. Boston	Boston	Boston Harbor	Issued
MBTA Lincoln Power	Boston	Boston Harbor	Issued
Seaboard Enterprises	Boston	Reserve Channel	Issued
Braintree Electric-Allen St.	Braintree	Weymouth Fore River	Issued
Michigan Abrasive	Braintree	Monatiquot River	Issued
Armstrong Cork Co.	Braintree	Weymouth Fore River	Unissued
Cities Service Oil Co.	Braintree	Weymouth Fore River	Issued
Braintree Electric-Potter #1	Braintree	Weymouth Fore River	Issued
Thomas Quinn Co., Inc.	Burlington	Butterfield Pond	Issued
Cambridge Electric Co.	Cambridge	Charles River	Issued
Cambridge Electric Co.-Kendall	Cambridge	Charles River	Issued
Dewey & Almy Chemical	Cambridge	Fresh Pond Brook	Issued
Mass. Institute of Technology	Cambridge	Charles River	Issued
Boston & Maine	Cambridge	Charles River	
Plymouth Rubber Co.	Canton	Neponset River	Issued
National Starch & Chem. Corp.	Canton	Neponset River	Unissued
Amoco Oil Co.	Chelsea	Chelsea Creek	Issued
Gulf Oil Co.	Chelsea	Chelsea River	Issued
Metropolitan Petroleum	Chelsea	Mystic River	Issued
Northeast Petroleum	Chelsea	Chelsea River	Issued
Samuel Cabot	Chelsea	Chelsea River	Issued
Texaco, Inc.	Chelsea	Mystic River	Issued
General Electric	Chelsea	Chelsea River	Unissued
Northeast Petroleum	Chelsea	Chelsea River	Unissued
Allied Concrete Corp.	Everett	Island End River	Issued

Table 3-3 (cont.)

Name of Firm	Location	Receiving Waters	Permit Status
Avco Everett Research	Everett	Mystic River	Issued
Boston Edison-Mystic St.	Everett	Mystic River	Issued
Exxon Oil Co.	Everett	Mystic River	Issued
Monsanto Co.	Everett	Mystic River	Issued
Dennison Mfg. Co.	Framingham	(Storm Sewer)	Issued
General Motors Corp.	Framingham	Beaver Dam Brook	Issued
Sealtest Foods	Framingham	Sudbury River	Unissued
Merriman, Inc.	Hingham	Weir River	Issued
The Barcelene Co.	Holbrook	Cochato River	Unissued
Spir-It., Inc.	Malden	Mystic River	Issued
Carling Brewing Co.	Natick	Lake Cochituate	Issued
U.S.Army-Natick Labs.	Natick	Lake Cochituate	Issued
Community Fuel Co.	Newton	Charles River	Issued
St. Regis Paper	Newton	Charles River	Issued
Stowe-Woodward Co.	Newton	South Meadow Brook	Unissued
S.W. Industries	Newton	Charles River	Unissued
White Fuel Corp.	Newton	Charles River	Issued
American Biltrite-Amtico	Norwood	Neponset River	Issued
Bird & Son, Inc.	Norwood	Neponset River	Issued
Factory Mutual Eng.	Norwood	Neponset River	Issued
Raytheon Co.	Norwood	Neponset River	Issued
Duwal Corp.	Norwood	Neponset River	Issued
General Dynamics	Quincy	Weymouth Fore River	Issued
Procter & Gamble Mfg.	Quincy	Weymouth Fore River	Issued
Quincy Oil Co.	Quincy	Town River	Issued
Chase & Sons, Inc.	Randolph	Weymouth Fore River	Issued
Atlantic Richfield	Revere	Chelsea River	Issued
Gibbs Oil Co.	Revere	Chelsea River	Issued
Northeast Petroleum	Revere	Chelsea River	Issued

Table 3-3 (cont.)

Name of Firm	Location	Receiving Waters	Permit Status
Sun Oil Co.	Revere	Chelsea River	Issued
Union Petroleum Corp.	Revere	Chelsea River	Issued
Jetline Services, Inc.	Stoughton		Unissued
Wakefield Bearing Co.	Wakefield	Wakefield Brook	Issued
Power Products	Wakefield	Saugus Brook	Issued
Spir-It, Inc.	Wakefield	Mill River	Unissued
Kendall CO.-Fibre Products	Walpole	Neponset River	Issued
Lloyd Fry Co.	Walpole	Beaver Brook	Unissued
Bird & Son Paper Mill	Walpole	Neponset River	Issued
Hollingsworth & Vose	Walpole	Neponset River	Issued
Exxon Oil Co.	Waltham	Charles River	Issued
Shell Oil Co.	Waltham	Charles River	Issued
National Can Corp.	Waltham	Charles River Trib.	Issued
Raytheon Co.	Waltham	Charles River	Unissued
Barry Div - Barry-Wright Corp.	Watertown	Charles River	Issued
Quincy Market Cold Storage	Watertown	Charles River	Issued
Haartz-Mason, Inc.	Watertown	Charles River	Issued
Boston Edison - Edgar Station	Weymouth	Weymouth Fore River	Issued
Avco Systems, Div.	Wilmington	Maple Meadow Brook	Issued
General Electric	Wilmington	Ipswich River	Unissued
J. H. Winn, Inc.	Winchester	Mystic River	Issued

Table (3-4) - Significant Industries, as Identified by NPDES
Permit Applications, Outside the MDC Sewer Service Area

Name of Firm	Location	Receiving Waters	Permit Status
U.S.M. Corp.-Mach. Div.	Beverly	Lower Holding Pond	Issued
Varian Associates	Beverly	unnamed brook	Issued
Ventron Corp.	Beverly	Danvers River	Issued
J.J. Henry Co., Inc.	Cohasset	Bound Brook	Unissued
GTE, Sylvania, Inc.	Danvers	Mill Pond	Issued
GTE Sylvania, Inc.	Danvers	Waters River	Issued
White Fuel Corp.	Danvers	Waters River	Unissued
Marine Research Institute	Duxbury	Duxbury Bay	Issued
William F. Clapp Labs.	Duxbury	Duxbury Bay	Unissued
Standard Rubber Products	Hanover	Drinkwater River	Issued
R.E.C. Mfg. Co.	Holliston	Charles River	Issued
Nepsco Metal Prod.	Holliston	storm drain	Unissued
Axton-Cross Co.	Holliston	Charles River	Unissued
Valpey Corp.	Holliston	Charles River Trib.	Unissued
Hudson Light & Power	Hudson	Assabet River	Issued
Atlantic Aquarium	Hull	Boston Harbor	Unissued
Myeltronics Corp.	Littleton	Fort Pond	Unissued
N.E. Apple Products	Littleton	Mill Brook	Unissued
Warren Communication	Littleton	Fort Pond	Unissued
Exxon Corp.	Lynn	Storm drain	Unissued
General Electric-A.F. Plant	Lynn	Saugus River	Issued
Digital Equipment Corp.	Maynard	Assabet River	Unissued
USM Corp.-Medway Div.	Medway	Charles River	Issued
Your Laundry	Medway	Charles River	Unissued

Table 3-4

Name of Firm	Location	Receiving Waters	Permit Status
USM Corp.-Chem. Div.	Middleton	Ipswich River	Issued
Archer Rubber Co.	Milford	Charles River	Issued
Foster-Forbes Glass	Milford	Charles River	Unissued
Cott Corp.	Millis	Charles River	Issued
GAF-Millis	Millis	Charles River	Issued
Eastman Gelatin Corp.	Peabody	Goldtphaite Brook	Issued
Peabody Municipal Light	Peabody	Procter Brook	Issued
Beatrice Foods Co.	Peabody	Danvers River	Unissued
Cat Cove Marine Lab.	Salem	Beverly Harbor	Unissued
New England Power	Salem	Salem Harbor	Issued
GTE Sylvania Inc.	Salem	North River	Unissued
Salem Oil & Grease	Salem	North River	Issued
Eastern Tool & Stamping	Saugus	Saugus River	Unissued
M. DeMatteo Construction	Saugus	Saugus River	Unissued
Golden Rooster Restaurant	Scituate	The Gulf	Issued
Metal Bellows Corp.	Sharon	School Meadow Brook	Issued
J. Melone & Sons, Inc.	Stow	Stow Brook	Unissued
Linde Corp.	Sudbury	Sudbury River	Unissued
Union Carbide	Sudbury	Wash Brook	Unissued
Lynn Sand & Stone Co.	Swampscott	Fosters Dam Pond	Issued
Raytheon Co.	Wayland	Sudbury River	Issued
Doms Cleaners	Wayland	Snake Brook	Unissued
Massachusetts Broken Stone	Weston	Story Brook	Issued
Crosby Value & Gage	Wrentham	Lake Archer	Unissued

TABLE 3-5 SUMMARY OF SERVICE INDUSTRY CATEGORIES
IN SEWERED AREAS

Service industry	Possible significant	Non-significant	Total
Restaurants	24	-	24
Laundromats	-	22	22
Hospitals	8	2	10
Photo-finishers	<u>4</u>	<u>14</u>	<u>18</u>
Total	36	38	74

TABLE 3-6 SUMMARY OF SERVICE INDUSTRY CATEGORIES
IN UNSEWERED AREAS

Service industry	Possible significant	Non-significant	Total
Restaurants	7	-	7
Laundromats	-	5	5
Hospitals	-	-	-
Photo-finishers	<u>3</u>	<u>7</u>	<u>10</u>
Total	10	12	22

Laundromats, as indicated in Tables 3-5 and 3-6, are mostly located in sewerage areas. Our analysis indicates that with a typical discharge, they probably will contribute less than the criteria established for significant dischargers. For this reason, they have been classified as non-significant.

Ten private hospitals have been identified, all of which are located in sewerage areas. The normal wastes discharged by hospitals are compatible with biological waste treatment facilities. According to the EPA studies* covering hospitals, the waste discharged from such institutions has a BOD and SS strength within or slightly in excess of the range of values found in domestic wastes. According to the particular activities undertaken, hospitals may generate other wastes such as blood and pathological materials, mercury, X-ray developing solutions and radionuclides. Most of these wastes are collected and incinerated or recycled. Discharge of radionuclides is controlled and monitored by the Department of Public Health of the Commonwealth of Massachusetts. Since the water supply to many of the identified hospitals is neither metered nor billed, it is difficult to determine the quantity of wastes that is discharged. However, from the limited data available from surveying these hospitals, a bed capacity of 100 may result in a waste discharge of 50,000 gpd or greater. For this reason, eight of the 10 hospitals have been classified as possible significant.

All photo-finishers were contacted by telephone to ascertain those industries that are actually undertaking photo-processing work, and those that send their work to other shops for processing. All those conducting processing work are classified as possible significant. As indicated in Tables 3-5 and 3-6, out of 28 identified industries, seven have been so classified.

No service industries have been identified as significant dischargers due to insufficient data. In order to develop the necessary data, it will be necessary to develop a sampling and monitoring program on a selective basis. The results of such a program would permit a better definition of the characteristics of the wastes discharged by service industries.

4. Screening of the SIC Code Industries (Very Wet, Wet, Dry). Of the 993 possible significant industries initially identified in the Very Wet Industry category, 343 industries remain as possible significant industries following the telephone survey and subsequent screening. Of the 343, 195 lie within sewerage areas, and 148 are located in unsewered areas.

Tables 3-7 and 3-8 provide a classification breakdown by SIC code for the firms in the Very Wet category showing those located in sewerage and unsewered areas, respectively.

It should be recognized that industries in unsewered areas were presumed not to be dischargers of wastewater unless a permit had been applied for by an industry. In that case, the industry fell into the NPDES category. Otherwise, industries in unsewered areas were considered as not discharging or discharging to land, both of which call for a classification of non-significant.

* Development Document for Interim Final Effluent Limitations, Guidelines and Proposed New Source Performance Standards for the Hospital Point Source Category, United States Environmental Protection Agency, EPA 440/1-76/060n, April, 1976.

Table 3-7 SUMMARY OF VERY WET INDUSTRY CATEGORY IN SEWERED AREAS

	SIC code	Possible significant	Non-significant	Moved or out of business	Total
20	Food	16	27	13	56
22	Textile	3	9	11	23
26	Paper	0	5	3	8
27	Printing	8	11	3	22
28	Chemical	30	34	18	82
29	Petroleum	1	1	1	3
30	Rubber-Plastics	0	1	0	1
31	Leather Tanning and Finishing	42	19	20	81
33	Primary Metal	2	3	2	7
34	Fabricated Metal	28	29	14	71
35	Machinery except Electrical	14	153	22	189
36	Electrical Machinery	31	34	19	84
37	Transportation Equipment	4	21	2	27
38	Instruments	8	21	4	33
39	Miscellaneous Manufacturing Industries	<u>8</u>	<u>14</u>	<u>8</u>	<u>30</u>
	Total	195	382	140	717

TABLE 3-8 SUMMARY OF VERY WET INDUSTRY CATEGORY IN DETERMINED AREA

SIC code	Possible significant	Non-significant	Moved or out of business	Total
20 Food	13	3	1	17
22 Textile	2	4	2	8
26 Paper	0	1	0	1
27 Printing	11	2	3	16
28 Chemical	4	10	4	18
29 Petroleum	0	0	0	0
30 Rubber-Plastics	0	0	0	0
311 Leather Tanning and Finishing	0	0	0	0
33 Primary Metal	0	1	0	1
34 Fabricated Metal	22	0	3	25
35 Machinery, except Electrical	29	46	10	85
36 Electrical Machinery	32	10	7	49
37 Transportation Equipment	4	12	0	16
38 Instruments	14	3	3	20
39 Miscellaneous Manufacturing Industries	<u>17</u>	<u>1</u>	<u>2</u>	<u>20</u>
Total	148	93	35	276

Industrial discharges to the ground are regulated by the local community or the Massachusetts Department of Environmental Quality Engineering (DEQE). Discharges of 15,000 gpd or less to the ground are regulated by the local Board of Health. Any discharges greater than this required DEQE approval. Consequently, it can be assumed that the 148 possible significant industries located in the unsewered areas are non-significant. However, four industries in this category (Very Wet, unsewered) were retained in the possible significant classification because the data indicates that they may either discharge to a surface waterbody without an NPDES permit or have the potential of discharging a toxic waste.

Most of the identified industries within the Very Wet category employ less than 50 people, and correspondingly, in most cases, the volume of discharge is not substantial. The difficulty lies in the characteristics of the wastes, which are derived from a process that either produces a toxic material, a high or low pH, and/or a cooling water discharge.

Incidental to this investigation, industries were identified as discharging small quantities of process waste, usually cooling water, to a surface watercourse without having been listed as filing for a NPDES permit application. These industries have been classified as significant industries.

Table 3-7 indicates that within sewered areas, those industries that have the greatest potential for discharging possible significant discharges are engaged in the following SIC code activities:

- 1) SIC Code 311, Leather Tanning and Finishing;
- 2) SIC Code 36, Electrical Machinery;
- 3) SIC Code 28, Chemical;
- 4) SIC Code 34, Fabricated Metal; and
- 5) SIC Code 20, Food.

In some cases, a pattern of non-significant dischargers was indicated in the data base. This was so for smaller industries within the following SIC code activities:

- 1) 3544 - Special Dies and Tools;
- 2) 3559 - Special Industry Machinery;
- 3) 3599 - Machinery, except Electrical;
- 4) 3732 - Boat Building and Repairing; and
- 5) 2051 - Bread and other Bakery Products.

Smaller industries within these SIC codes are indicated to either have no process waste discharge, a compatible discharge of low volume, or to recycle their process wastes. The latter is especially true of the machinery industry which normally recycles their spent oil solutions.

Classification of industries having Wet or Dry SIC codes and meeting the applicable 250 or 100 or more employment criteria are set forth in Table 3-9. Of the identified industries, only one is located in an unsewered area. This particular industry is a book printer who produces a possible significant discharge from an etching process. The other five possible significant industries produce paper board boxes and abrasives.

In the identification process, those industries that did not meet the employment criteria under Wet and Dry SIC codes were entered into the data base. A limited amount of screening was done for this particular group, and those that were not screened have been listed as unclassified. Unclassified industries are being held for future evaluation. The results of the limited survey undertaken for this group is presented in Table 3-10 and Table 3-11.

On further evaluation, it may be possible to eliminate many of the unclassified industries since they are engaged in essentially SIC code activities that have little, if any, process waste.

Following the telephone survey and subsequent screening, the 207 possible significant industries remaining were reviewed using the definition of a significant industrial discharger. Fifty-one industries were identified as significant. These are listed in Table 3-12. The listed industries are indicated as to whether they discharge greater than 50,000 gpd, have a potential for discharging a toxic effluent, or discharge to a watercourse without a discharge permit.

In Table 3-12 all industries that may discharge a waste that has toxic characteristics (plating discharges, etc.) have been classified as significant. This classification has been assigned even when information on the strength of the waste has not been available from the data base.

All pertinent information resulting from the screening process, including the identification of significant, possible significant and non-significant dischargers, has been entered in the data base. The data base consist of a list of the 1,874 industries that were identified in this survey, along with their flow and discharge characteristics where such information was available. The data base identifies those industries that have been classified as significant, possible significant, non-significant and those who have either moved out of the study area or gone out of business.

All 222 NPDES permit industries as well as the 207 industries that have been identified as significant or possible significant through the screening process have been mapped. These maps are available for public review at the MAPC office (44 School Street, Boston).

5. Existing Pretreatment Facilities. Industries that discharge to local sewer systems may be required to provide some form of pretreatment prior to discharge. The type of pretreatment will depend on the type of waste, the type of wastewater treatment and the local sewer use ordinance. Many industries presently have pretreatment facilities in operation. The existing pretreatment facilities in the region can be of assistance in determining the applicable pretreatment facilities required by an industry having a similar effluent.

Table 3-9 SUMMARY OF WET AND DRY INDUSTRY CATEGORIES WITH LARGE EMPLOYMENT¹ IN SEWERED AND UNSERWERED AREAS

SIC code	Possible significant	Non-significant	Moved or out of business	Total
Wet - employment >100				
26 Paper (except 2641, 2645, 2649)	3	1	1	5
2999 Petroleum	0	0	0	0
30 Rubber (except 301, 302, 303)	0	5	0	5
324, 329 Cement and Abrasives	2	0	0	2
325, 336 Nonferrous metals	0	1	0	1
Total	5	7	1	13
Dry - employment >250				
21 Tobacco	0	0	0	0
23 Apparel	0	1	0	1
24 Wood Products	0	0	0	0
25 Furniture	0	0	0	0
27 Printing (except 2711, 2753)	1	0	0	1
302 Rubber and Plastics Footwear (except 3021)	0	0	0	0
31 Leather Products (except 311)	0	0	0	0
32 Glass and Clay (except 324, 329)	0	10	0	10
332, 339 Foundries and Primary Metal Products	0	1	0	1
343, 344, 348 Heating Equipment, Metal Products, and Ordnance	0	0	0	0
Total	1	12	0	13

¹ Wet - employment > 100
Dry - employment > 250

Table 3-10 SUMMARY OF WET AND DRY INDUSTRY CATEGORIES WITH
SMALL EMPLOYMENT¹ IN SEWERED AREAS

SIC code	Possible significant	Non-sig- nificant	Moved or out of business	Unclassi- fied	Total
Wet - employment <100					
26 Paper (except 2641, 2645, 2649)	2	1	1	4	8
2999 Petroleum	0	0	0	0	0
30 Rubber (except 301, 302, 303)	0	1	0	26	27
324, 329 Cement and Abrasives	0	1	0	2	3
335, 336 Nonferrous Metals	0	0	0	8	8
Total	2	3	1	40	46
Dry - employment <250					
21 Tobacco	0	0	0	1	1
23 Apparel	0	7	0	35	42
24 Wood Products	0	4	0	31	35
25 Furniture	0	2	0	40	42
27 Printing (except 2711, 2753)	0	3	0	70	73
302 Rubber and Plastics Footwear (except 3021)	0	0	0	1	1
31 Leather Products (except 311)	0	3	2	72	77
32 Glass and Clay (except 324, 329)	0	5	0	18	23
332, 339 Foundries and Primary Metal Products	0	1	0	6	7
343, 344, 348 Heating Equipment, Metal Products and Ordnance	0	2	0	40	42
Total	0	27	2	314	343

¹ Wet - employment < 100
Dry - employment < 250

Table 3-11 SUMMARY OF WET AND DRY INDUSTRY CATEGORIES WITH
SMALL EMPLOYMENT¹ IN UNSWERED AREAS

SIC code	Possible significant	Non-sig- nificant	Moved or out of business	Unclasi- fied	Total
Wet - employment <100					
26 Paper (except 2641, 2645, 2649)	0	1	1	1	3
2999 Petroleum	0	0	0	0	0
30 Rubber (except 301, 302, 303)	0	0	0	16	16
324, 329 Cement and Abrasives	0	0	0	5	5
335, 336 Nonferrous Metals	0	0	0	1	1
Total	0	1	1	23	25
Dry - employment <250					
21 Tobacco	0	0	0	0	0
23 Apparel	0	0	0	3	3
24 Wood Products	0	1	0	18	19
25 Furniture	0	0	0	14	14
27 Printing (except 2711, 2753)	0	0	0	31	31
302 Rubber and Plastics Footwear (except 3021)	0	0	0	0	0
31 Leather Products (except 311)	0	0	0	1	1
32 Glass and Clay (except 324, 329)	0	0	0	15	15
332, 339 Foundries and Primary Metal Products	0	0	0	4	4
343, 344, 348 Heating Equipment, Metal Products, and Ordnance	0	0	0	16	16
Total	0	1	0	102	103

1 Wet - employment < 100
Dry - employment < 250

Table 3-12 INDUSTRIES CLASSIFIED AS SIGNIFICANT(1)

Name of Firm	Location	Discharge greater than 50,000 gpd	Potential toxic effluent	May discharge to watercourse without permit
Comdell, Inc.	Beverly	-	Yes	-
Garnard Mfg. Co.	Beverly	-	Yes	-
Creese & Cook, Inc.	Danvers (Water St.)	Yes	Yes	-
North Shore Cutting Die, Inc.	Danvers	-	Yes	-
Creese & Cook, Inc.	Danvers (Clinton Ave.)	-	Yes	-
Nu-Style Co., Inc.	Franklin	-	Yes	-
Hudson Lock, Inc.	Hudson	-	Yes	-
John Boyde Co.	Lynn	Yes	-	-
C. W. Chrome	Lynn	-	Yes	-
Everett Plating and Metal Finishing	Lynn	-	Yes	-
Nissen Baking Corp.	Lynn	Yes	-	-
West Lynn Creamery, Inc.	Lynn	Yes	-	-
Dav-Tech Plating	Marlborough	-	Yes	-
Gotham Ink of N.E., Inc.	Marlborough	-	-	Yes
Koehler Mfg. Co.	Marlborough	-	Yes	-

Table 3-12 (Continued). INDUSTRIES CLASSIFIED AS SIGNIFICANT(1)

Name of firm	Location	Discharge greater than 50,000 gpd	Potential toxic effluent	May discharge to water body without permit
Stop and Shop	Marlborough	Yes	-	-
Mass. Container	Marlborough	-	Yes	-
Butcher Polish Co.	Marlborough	-	Yes	-
Hycomp, Inc.	Maynard	-	Yes	-
Beam Tube Corp.	Milford	-	Yes	-
Milford Daily News	Milford	-	Yes	-
Industrionics, Inc.	Millis	-	Yes	-
Bond Leather & Splitting Co.	Peabody	-	Yes	-
Consolidated Color Corp.	Peabody	-	Yes	-
Fermon Leather Co., Inc.	Peabody	Yes	Yes	-
N.H. Matz Leather Co., Inc.	Peabody	-	Yes	-
New England Carbide Tool Co.	Peabody	-	-	Yes
Remis Industries	Peabody	Yes	Yes	-
Tan Rite Leather Corp.	Peabody	Yes	Yes	-
Victory Tanning Corp.	Peabody	Yes	Yes	-
J.E.C. Tanning Co.	Peabody	Yes	Yes	-

Table 3-12 (Continued). INDUSTRIES CLASSIFIED AS SIGNIFICANT (1)

Name of firm	Location	Discharge greater than 50,000 gpd	Potential toxic effluent	May discharge to watercourse without permit
Stahl Finish	Peabody (Howley St.)	-	-	Yes
F. L. & J. C. Codman Co.	Rockland	-	-	Yes
Progressive Engineering, Inc.	Rockland	-	-	Yes
Dions Yacht Yard	Salem	-	-	Yes
J. Flynn & Sons, Inc.	Salem	Yes	Yes	-
GTE Sylvania Equipment and Development	Salem (121 Loring Ave.)	-	Yes	-
GTE Sylvania, Inc.	Salem (Boston St.)	Yes	-	-
GTE Sylvania, Inc.	Salem (71 Loring Ave.)	Yes	-	-
Hawthorne Tanners, Inc.	Salem	Yes	Yes	-
Leach-Heckel Leather Co.	Salem	Yes	Yes	-
Pioneer Tanning Co., Inc.	Salem	-	Yes	-
Salem News Publishing Co., Inc.	Salem	-	Yes	-
Salem Suede, Inc.	Salem	Yes	-	-
Salem Plating	Salem	-	Yes	-

Table 3-12 (Continued). INDUSTRIES CLASSIFIED AS SIGNIFICANT(1)

Name of firm	Location	Discharge greater than 50,000 gpd	Potential toxic effluent	May discharge to watercourse without permit
Sunburst Fruit Juice, Inc.	Salem	-	-	Yes
Eastern Industrial Oil Products Co.	Saugus	-	-	Yes
W. R. Grace & Co.	Acton	Yes	Yes	-
Gem Gravure Co., Inc.	Hanover	-	Yes	-
Beckwith Laminar Corp.	North Reading	-	-	Yes
L. B. Darling Co., Inc.	Southborough	-	-	Yes

1. Not including NPDES industries.

The data base was reviewed to determine those industries that currently provide some form of pretreatment before discharging process waste to a sewer system. A list of such industries, the type of effluent treated and the treatment process are set forth in Table 3-13. These data have a value in determining those industries for which case histories may be developed. Of particular interest are those industries that recycle their wastes and eliminate any discharge.

D. Further Evaluation

An evaluation of the information in the data base was undertaken to establish those industrial discharges for which questionnaire, sampling and monitoring, and case history programs should be developed. The evaluation process primarily concentrated on those industrial discharges that were classified as possible significant and significant.

In order to aid areawide 208 planning, questionnaire, sampling and monitoring, and case history programs should be designed so as to:

- 1) Permit a better definition of the pollution problems in the area;
- 2) Aid in defining pretreatment requirements or assess the effectiveness of existing pretreatment facilities;
- 3) Aid in developing ordinances, rules and regulations; and
- 4) Aid communities in industrial land-use planning.

To provide the most effective results, the programs were integrated. The questionnaire program was developed to determine the need for sampling and monitoring, the potential for case history analysis, and the willingness of a particular industry to participate in a case history program.

1. Data Base Review. The results of the screening process as described in the preceding chapter indicate that for the Very Wet category in sewered areas, possible significant industrial discharges are most frequently engaged in SIC Code 311 - Leather Tanning and Finishing; SIC Code 36 - Electrical Machinery; SIC Code 28 - Chemical Activities; SIC Code 34 - Fabricated Metal; and SIC Code 20 - Food. In unsewered areas, possible significant industrial dischargers are most frequently engaged in SIC Code 35 - Machinery, except Electrical; SIC Code 36 - Electrical Machinery; SIC Code 34 - Fabricated Metal; and SIC Code 39 - Miscellaneous Manufacturing Industries. The existing data covering activities within the above SIC codes were reviewed. The purpose of this review was to establish those areas where the findings of any further investigation would have the widest application and would address a specific industrial waste need within the MAPC area.

Table 3-14 indicates those industrial dischargers that were initially selected for the development of the questionnaire, sampling and monitoring, and case history programs. Based on the findings of the questionnaire program, the identified sampling and monitoring and case history programs were modified.

Table 3-13 INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

NAIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
2013	Sausage Kitchen, Inc.	Saugus	50		Process (wash up)	Grease trap
2013	Holiday Brand Foods	Lynn	50		Process (wash up)	Grease traps
2013	F. Demakes & Co., Inc.	Lynn		50	Process (wash up)	Grease trap
2086	Cott Beverage	Millis		50	Process (wash up)	Proposed: equal- ization, neutral- ization, bio disks, aerobic digesters
2099	Vincent Potato Chip Co.	Salem		50	Process	Proposed: screen- ing and recycling
2211	Marblehead Mfg. Co.	Marblehead		50	Process (dye)	Neutralization and bleaching
2291	GAF Corp.	Franklin		50	Process	Screening and equalization
2653	J&J Corrugated Box Corp.	Franklin		50	Process	Package chemical treatment unit
2711	Milford Daily News	Milford		50	Process (devel- oper and fixer solutions)	Proposed: silver recovery unit
2711	Salem News	Salem Publishing Co.		50	Process (etching, bath solution)	Soda ash addition

Table 3-13(Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

JIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
2818	Seaboard Chemicals	Salem	50		Process (sulpho- nated oil and sulfuric acid)	Neutralization
2819	Ventron Corp.	Beverly		50	Process	Sedimentation, chemical precipi- tation, neutrali- zation
2821	Strem Chemical	Danvers	50		Process	Neutralization
2842	Chemical Applica- tions Co.	Beverly	50		Process (hydro- chloric acid)	Neutralization
2842	Stahl Finish	Peabody	50		Process	Sedimentation
2842	Smidt, Samuel Chemical Corp.	Peabody	50		Process	Screening
2842	Lloyd Laboratories	Peabody	50		Process	Sedimentation
2843	Bay State Chemical Co.	Peabody	50		Process	Sedimentation
2843	Bay State Oil Products	Peabody	50		Process (sulpho- nated oil and sulfuric acid)	Sedimentation
2843	William J. Dodge Co.	Salem	50		Process (sulpho- nated oil and sulfuric acid)	Neutralization, oil separation

Table 3-13(Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

SIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
2843	Eastern Industrial Oil Products	Saugus	50		Process (sulpho- nated oil and sulfuric acid)	Neutralization, oil separation
2851	Pohl Color and Chemical Corp.	Salem	50		Process	Sedimentation
2891	C. L. Hawthaway & Sons	Lynn		50	Process	Sedimentation
2891	Borden Chemical Co.	Peabody		50	Process	Proposed: sedi- mentation
2952	GAF Corp.	Millis		50	Process	Sedimentation, chemical precipi- tation, oil traps
3111	Creese & Cook Co.	Danvers (Clinton Ave.)	50		Process	Screening
3111	Bond Leather and Splitting Co.	Peabody	50		Process	Sedimentation
3111	Remis Industries	Peabody	50		Process	Sedimentation
3111	Tan-Rite Leather Corp.	Peabody		50	Process	Screening, sedi- mentation
3111	Pioneer Tanning Co.	Salem	50		Process	Sedimentation, grease traps, filters

**Table 3413 (Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE**

SIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
3111	Hawthorne Tanners, Inc.	Salem	50		Process	Sedimentation, grease recovery
3111	Salem Suede, Inc.	Salem	50		Process	Sedimentation
3111	Truche Tanning Co.	Salem	50		Process	Sedimentation
3111	Creese & Cook	Danvers (Water St.)	50		Process	Sedimentation
3111	A. C. Lawrence	Peabody (Webster St.)	50		Process	Sedimentation
3111	Sirois Bros.	Peabody	50		Process	Sedimentation
3111	Leach and Heckel	Salem	50		Process	Sedimentation
3423	Kimball Needle Co.	Lynn	50		Process (cutting oil or grease)	Recycle
3423	Bay State Cutting Die Co.	Lynn	50		Process (plat- ing)	Spent solution recycled; rinse water recycled
3423	Rexnord, Inc.	Maynard	50		Process (cutting fluid)	Recycled
3423	North Shore Cut- ting Die, Inc.	Danvers	50		Process (tin plating)	Spent Solution recycled; rinse water recycled

Table 3-13 (Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

SIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
3451	Sterling Machine Co.	Lynn	50		Process (cutting oil or grease)	Recycled
3451	New England Screw Machine Co.	Lynn	50		Process (cutting oil or grease)	Recycled
3451	Marver Cam Co.	Lynn	50		Process (cutting oil or grease)	Recycled
3471	Dav-Tech Plating Lab	Marlborough	50		Process (nickel plating)	Nickel recovered
3471	C. W. Chrome	Lynn	50		Process (plat- ing)	Spent solution recycled; rinse water to sewer
3471	Salem Plating	Salem	50		Process (plat- ing)	Spent solution recycled; rinse water to sewer
3471	Everett Plating & Metal Finishing	Lynn	50		Process (nickel and zinc plat- ing)	Ion exchange, pH adjustment
3471	Nu-Style Co., Inc.	Franklin		50	Process (gold and nickel plat- ing)	Gold recovered
3494	Ruggles-Klingman Mfg. Co.	Salem	50		Process (cutting oil or grease)	Recycled

Table 3-13 (Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED
PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

SIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
3544	Hub Machine Die Co.	Lynn	50		Process (cadmium plating)	Spent solution recycled; rinse water recycled
3552	Progressive Engi- neering	Rockland	50		Process (nickel plating)	Spent solution recycled; rinse water recycled
3559	Prime Mfg. Co.	Lynn	50		Process (cutting oil)	Recycled
3559	Boston Machine Works Co.	Lynn	50		Process (cutting oil or grease)	Recycled
3573	Digital Equipment Corp.	Maynard	50		Process (plat- ing)	Metallurgical treatment facility
3573	Data General	Southborough	50		Process (plat- ing)	Spent solution recycled; rinse water recycled
3623	Thermo-Craft Eng.	Lynn	50		Process (cutting oil or grease)	Recycled
3642	Koehler Mfg. Co.	Marlborough	50		Process	Neutralization
3662	Chu Assoc.	Littleton	50		Process (cutting oil)	Recycled

Table 3-13 (Continued). INDUSTRIES KNOWN TO HAVE EXISTING OR PLANNED PRETREATMENT FACILITIES BEFORE SEWER DISCHARGE

SIC code	Industry	Location	No. of employees		Type of effluent treated	Treatment process
			Less than	More than		
3679	Hycomp, Inc.	Maynard	50		Process (gold plating)	Spent solution to chemical treatment to sewer; rinse water to sewer
3679	EG&G, Inc.	Salem		50	Process (plating)	Deionizing column, neutralization
3679	Hyletronic Corp.	Littleton		50	Process (plating)	Spent solution recycled; rinse water recycled
3811	Waters Assoc., Inc.	Milford		50	Process (acid)	Neutralization
3811	Harvard Apparatus Co., Inc.	Millis		50	Process (cutting oil)	Recycled
3821	V.I.P. Div. of Pride Industries	Lynn		50	Process (cutting oil or grease)	Recycled
7395	Sanborn Studios	Lynn		50	Process	Holding tank, neutralization
7395	Photo Swift, Inc.	Marblehead		50	Process	Filter

2. Results of Questionnaire Program. The more significant results of the questionnaire program are summarized in Table 3-14. Of the 28 firms sent questionnaires, 20 replied and one firm moved out of the study area. In the following paragraphs, the results of the questionnaire program are discussed by industrial SIC code classification.

For SIC Code 311 - Leather Tanning and Finishing, responses to the questionnaire program indicate that there is insufficient available information from industrial sources to determine the characteristics of the wastewater discharged by the local retanning and leather finishing industry.

Four of the industries within this classification were sent questionnaires for the purpose of identifying pretreatment facilities. Three of the four industries replied to the questionnaire. The responses indicate that one industry provides sedimentation and another industry sedimentation and grease recovery pretreatment facilities.

The main purpose of developing case histories is to illustrate local pretreatment practices that will have wide application throughout the local industry. The investigation of the replies within SIC Code 311 indicates that local pretreatment practices are not sufficiently sophisticated to warrant case history development.

For SIC Code 28 - Chemical activities, as indicated in Table 3-15, complete responses to the questionnaire program within the leather finishing chemical and sulphonated oil industries were severely limited. Information available from local industrial sources is insufficient to define the characteristics of the wastewater discharged by these industries.

Comparison of the wastes discharged by two industrial plants that produce adhesives was not possible. This was so because the industrial plant that discharged to a local sewer system has been moved outside of the study area.

As in the case of the leather tanning and finishing industry, the development of case histories based on the information available from the questionnaire program does not appear warranted.

For SIC Codes 34 - Fabricated Metal; 35 - Machinery, except Electrical and 36 - Electrical Machinery, plating wastes, which may be derived from any of the applicable SIC codes within this category, have the potential for containing toxic wastes in such concentrations as to disrupt a biological treatment process. For this reason ten industries were sent questionnaires. Of the ten, six industries replied. One of these industries was identified as having only a sanitary discharge and accordingly was classified as a non-significant industry. Of the remaining five, two industries submitted an analysis of the wastewaters that are discharged to the local sewer system.

Within the plating industry, concentrated spent solutions appear to be disposed of by private contractors. The rinse waters are discharged to the local sewer system. With the information at hand, it is not possible to determine if rinse water wastes should be pretreated before discharge to the local sewer system.

Preliminary information indicated that three industries might be utilizing recycle systems. Recycle systems could eliminate or limit the discharge of rinse waters to the local sewer system. Responses to the questionnaire program

Table 3-14 QUESTIONNAIRE, SAMPLING AND MONITORING AND CASE HISTORY ANALYSIS LIST

SIC code	Firm and location	Type waste	Area	Questionnaire	Information and monitoring			Case history	Remarks
					data base	Sampling	Treatment facilities		
311	Carr Leather Co., Inc. Lynn	Tanning	Sewered	Yes	-	-	-	-	Information only
311	Cut-Rite Leather Splitting Co. Peabody	Tanning	Sewered	Yes	-	-	-	-	Information only
311	Bond Leather Co. Peabody	Retanning	Sewered	Yes	Yes	Yes	Yes	Possible	
311	Reinis Industries Peabody	Beam house	Sewered	Yes	Yes	Yes	Yes	Possible	
311	Hawthorne Tanners Salem	Tanning	Sewered	Yes	Yes	Yes	No	Possible	
311	A.C. Lawrence, Webster Street Plant Peabody	Tanning	Sewered	Yes	Yes	Yes	No	Possible	
2843	William J. Dodge Co. Salem	Sulpho-nated oil	Sewered	Yes	-	Yes	Yes	Possible	
2818	Seaboard Chemicals Salem	Sulpho-nated oil	Sewered	Yes	-	Yes	Yes	-	Information only
2843	Eastern Industrial Oil Products Saugus	Sulpho-nated oil	Sewered	Yes	-	Yes	Yes	Possible	
3111	Ideal Finishing Co. Salem	Leather finisher	Sewered	Yes	-	Yes	-	-	Information only
2842	Stahl Finish, Howley Street Peabody	Finishing chemical	Sewered	Yes	-	Yes	-	-	Information only
2851	Pohl Color & Chemical Corp. Salem	Finishing chemical	Sewered	Yes	-	Yes	-	-	Information only
35	General Electric Lynn	Plating	Sewered	Yes	-	-	-	-	Information only

Table 3-14 (Continued). QUESTIONNAIRE, SAMPLING AND MONITORING AND CASE HISTORY ANALYSIS LIST

GIC code	Firm and location	Type waste	Area	Questionnaire	Information data base	Sampling and monitoring	Treatment facilities	Case history	Remarks
35	GTEsylvania Salem	Plating	Sewered	Yes	-	-	-	-	Information only
36	Mesur-Matic Electronic Corp. Salem	Plating	Sewered	Yes	-	-	-	-	Information only
3573	Digital Equipment Corp. Maynard	Plating	Sewered	Yes	Yes	-	Yes	Possible	
3679	ES&G, Inc. Salem	Plating	Sewered	Yes	-	Yes	Yes	Possible	
3552	Progressive Engineering Rockland	Plating nickel	Sewered	Yes	-	-	Recycle	Possible	Information only
3544	Hub Machine Die Co. Lynn	Plating cadmium	Sewered	Yes	-	-	Recycle	Possible	Information only
3423	North Shore Cutting Die, Inc. Danvers	Plating tin	Sewered	Yes	-	-	Recycle	Possible	Information only
3471	C. W. Chrome Lynn	Plating	Sewered	Yes	-	Yes	-	-	Information only
3679	Hycorp, Inc. Maynard	Plating gold	Sewered	Yes	-	Yes	-	-	Information only
22	Thomas Taylor & Sons, Inc. Hudson	Cloth finishing	Sewered	Yes	-	-	-	-	Information only
2086	Cott Beverages Mills	Beverages	Sewered	Yes	Yes	-	Yes	-	Information only
2086	Coca-Cola Bottling Co. Lynn	Beverages	Sewered	Yes	-	Yes	-	-	Information only
2099	Vincent Potato Chip Co. Salem	Potato chips	Sewered	Yes	-	Yes	Proposed	-	Information only

Table 3-14(Continued). QUESTIONNAIRE, SAMPLING AND MONITORING AND CASE HISTORY ANALYSIS LIST

SIC code	Firm and location	Type waste	Area	Questionnaire	Information data base	Sampling and monitoring	Treatment facilities	Case history	Remarks
2891	Borden Chemical Co.	Peabody	Adhesives	Sewered	Yes	Yes	Yes	Possible	
2891	Bostik Division USM Corp.	Middleton	Adhesives	Unsewered	Yes	Yes	Yes	Possible	

Table 3-15 RESULTS OF QUESTIONNAIRE PROGRAM

SIC code	Firm and location	Type waste	Area	Reply		Remarks
				Yes	No	
311	Carr Leather Co. Inc., Lynn	Retanning	Sewered	X		Waste analysis not available.
311	Cut-Rite Leather Splitting Co., Peabody	Retanning	Sewered	X		Waste analysis not available, name changed to Tan-Rite Splitting Co.
311	Bond Leather Co., Peabody	Retanning	Sewered		X	
311	Remis Industries, Peabody	Beam House	Sewered	X		Waste analysis available, pretreatment, sedimentation.
311	Hawthorne Tanners, Salem	Tanning	Sewered	X		Waste analysis available, pretreatment, sedimentation, and grease recovery.
311	A.C. Lawrence, Webster Street Plant, Peabody	Tanning	Sewered	X		Name changed to National Tanning and Trading Corp, limited waste analysis available, no pretreatment.
2843	Eastern Industrial Oil Products, Saugus	Sulpho-nated oil	Sewered	X		Waste analysis not available, pretreatment, neutralization, sedimentation, and oil separation.
2818	Seaboard Chemicals, Salem	Sulpho-nated oil	Sewered	X		Waste analysis not available, pretreatment, neutralization.
2843	William J. Dodge Co., Salem	Sulpho-nated oil	Sewered		X	
3111	Ideal Finishing Co., Salem	Leather Finisher	Sewered	X		Waste analysis not available.
2842	Stahl Finish, Howley Street, Peabody	Finishing Chemical	Sewered	X		Limited waste analysis available, pretreatment, sedimentation.
2851	Pohl Color and Chemical Corp., Salem	Finishing Chemical	Sewered		X	
35	General Electric, Lynn	Plating	Sewered	X		Waste analysis available, pretreatment, neutralization and clarification.
35	GTE Sylvania, Salem	Heat treating	Sewered	X		Limited waste analysis available.
36	Mesur-Matic Electronic Corp., Salem	Sanitary	Sewered	X		Non-significant industry.
3573	Digital Equipment Corp., Maynard	Plating	Sewered		X	

Table 3-15 (Continued) RESULTS OF QUESTIONNAIRE PROGRAM

SIC code	Firm and location	Type waste	Area	Reply		Remarks
				Yes	No	
3679	EG&G, Inc., Salem	Plating	Sewered		X	
3552	Progressive Engineering, Rockland	Plating Nickel	Sewered	X		Waste analysis not available, do not recycle wastes.
3544	Hub Machine Die Co., Lynn	Plating Cadmium	Sewered		X	
3423	North Shore Cutting Die, Inc., Danvers	Plating tin	Sewered	X		Waste analysis not available, do not recycle wastes.
3471	C.W. Chrome, Lynn	Plating	Sewered	X		Waste analysis not available, do not recycle wastes.
3679	Hycomp, Inc., Maynard	Plating gold	Sewered		X	
22	Thomas Taylor & Sons, Inc., Hudson	Cloth Finishing	Sewered	X		Waste analysis not available, no pre- treatment facilities.
2086	Cott Beverages, Mills	Beverages	Sewered	X		Waste analysis available, pretreatment planned.
2086	Coca-Cola Bottling Co., Lynn	Beverages	Sewered	X		Waste analysis available, no pretreat- ment planned.
2099	Vincent Potato Chip Co., Salem	Potato chips	Sewered	X		Waste analysis not available, pretreat- ment planned.
2891	Borden Chemical Co., Peabody	Adhesives	Sewered			Moved out of MAPC planning area.
2891	Bostik Division USM Corp., Middleton	Adhesives	Unsewered	X		Waste analysis not available, treatment, activated sludge plant.

indicate that no known industry within the study area has a recycle system. Two industries were indicated to provide pretreatment facilities, but these particular industries did not respond to the questionnaire program. Under the circumstances, the development of case histories for the plating industry based on local experience is not possible.

The results of the questionnaire program indicate that the two bottling companies surveyed have substantially different wastewater characteristics. The reasons for the differences have not been substantiated, but the results indicate that bottling companies cannot automatically be classified as significant or non-significant industries.

A wastewater analysis for the potato chip company surveyed was not available, and, therefore, particular conclusions relative to this local industry cannot be made. Similarly, conclusions about the compatibility of the wastewater discharged by the cloth finisher to a local sewer system cannot be made, since the characteristics of the wastewaters are not known.

3. Conclusions. The results of the questionnaire program indicate that there is a need for additional sampling and monitoring in order to fully identify significant industries within the MAPC 208 planning area. This seems to be particularly true of the Machinery and Fabricated Metal Industry which may discharge rinse waters from plating activities to a local sewer system without pretreatment.

However, in the near future, it can be anticipated that most, if not all, of the industries that have been identified for sampling and monitoring should be required to monitor their own wastes for the purpose of establishing industrial cost recovery charges. At that time, if proper updating techniques are followed, the characteristics of wastewaters discharged by the concerned industries should be available for entering in the industrial data base. For this reason, and because of the budgetary constraints of 208 planning, it was apparent that a sampling and monitoring program was not possible at this time.

In the original analysis, thirteen industries were preliminarily identified for possible case history analysis. Of these, four were in the tanning industry; two were in the sulphonated oil industry; five were involved with plating; and two were in the adhesive industry.

As previously noted, none of these industries presently have pretreatment facilities that can be used for case history analysis. For this reason, it is recommended that the portion of the 208 planning program covering case history analysis not be undertaken at this time.

E. Updating and Use of the Data Base

1. General. The data base that has been developed in this investigation is the only data source that covers all industrial discharges within that portion of the MAPC area outside the MDC sewer service area. The data base also includes those industries who discharge to watercourses within the MDC sewer service area.

The industrial situation within the MAPC area is a changing one, industries may enter or leave the area, existing industries may expand or add new products to their production lines. In such a situation, it is necessary to periodically update the data base if it is to reflect the current industrial discharge situation in the MAPC area.

Various uses of the data base are illustrated in this section. These uses indicate that the municipal level of government will derive the most benefit from the data base developed in this study.

2. Identification. The updating process should be designed to identify the following:

- 1) Any new industry; by location, SIC code classification, industrial discharge characteristics, and point of wastewater discharge;
- 2) Modifications to any existing industrial facility that materially changes the quantity and/or characteristics of the industrial wastes discharged;
- 3) Revisions to existing discharge points, as for example, an industrial wastewater that was previously discharged to a watercourse and then connected to a sewer;
- 4) Updated information concerning the quantity and characteristics of the industrial waste discharged by an identified industry;
- 5) Planned pretreatment or treatment facilities;
- 6) Significant or possible significant firms that move out of the study or go out of business.

3. Existing Permit Situation. It is important to identify those agencies that are required by Federal laws and Massachusetts statutes to review and permit various types of industrial discharges. This is because the information required from the particular industry in securing a permit may also be used to identify new discharges, their pretreatment or treatment requirements, and the characteristics of their wastewaters. All of this information is important resource material for maintaining an updated data base.

Surface Waters - Under P.L. 92-500, everyone discharging into surface waters is required to apply for a National Pollutant Discharge Elimination (NPDES) System Permit. By agreement, a permit application is filed with both the EPA and the MDWPC for review, and on approval, a joint permit is issued. Data on the permit includes the industry's name and address, identification of surface water receiving discharge, date to permit expiration, monitoring requirements, effluent characteristics limitations, and a schedule of compliance to meet the indicated limitations. The schedule of compliance could require elimination of the discharge, construction of treatment facilities, or connection to the existing sewer. If treatment facilities are required, an engineering report and construction plans are submitted to both the EPA and MDWPC for approval.

The permit application may contain information on the water use of the industry, existing treatment facilities, and a more complete description of effluent characteristics.

Both the permit and the permit application contain information that can be used to update the data base.

Sewer Connections - Under the Massachusetts General Laws, Chapter 21, Section 43, a permit is required for any sewer connection that will convey industrial wastes. The industry applies for a permit through the local sewer authority who approves the application and submits it to the MDWPC for approval. Upon approval a permit is issued to the local sewer authority. Data found in the permit includes quantity and characteristics of wastewater discharges where this information deemed to be significant. If during the approval process an engineering report is required, pertinent data from the report may also appear in the permit. Pretreatment facilities are approved by the MDWPC and information concerning these facilities is available in their files.

The approval process covers new connections to existing sewer systems and to extensions of existing sewer systems.

Although industries that are now connected to existing sewer systems require permits, this phase of the permit program is not funded. Accordingly, regulation of existing industrial connections is left up to the local sewer authority.

The information derived from the approval process can be a valuable source of data for updating the data base.

4. Sources of Information. In the following paragraphs the information available from each identified source is discussed.

EPA - Industrial cost recovery and user charge studies are submitted to the EPA for approval. These studies identify industries and the characteristics of their industrial discharges. Such information can be used to update the data base either by providing new information or to correct or confirm existing data.

EPA - MDWPC - In some instances, similar information is available from both the EPA and the MDWPC. NPDES permit applications which are approved jointly by the EPA and MDWPC can be identified by either agency. The EPA maintains a computerized file of the current NPDES situation, and computer print-outs can be obtained at any time. Comparing up-to-date listings with the data will offer a quick means of identifying new industries and reviewing existing industries for any change in their status. The EPA maintains a file of permit applications and permits which should be reviewed to identify industrial wastewater flows, treatment processes, effluent characteristics, and names of receiving waterbodies.

Facility Planning studies (201) are submitted to both MDWPC and EPA for review and approval. These studies must identify the existing industrial situation with particular reference to significant dischargers. These studies should be reviewed to identify any pertinent information.

MDWPC - The MDWPC undertakes River Basin 303(e) studies in which all point sources that discharge into a given waterbody are identified, sampled, and monitored. Since these studies are undertaken normally before 201 Facilities Planning, they constitute a prime source of information. In some instances, information on sampling and monitoring may be withheld if the data is to be involved in litigation, or if industries request it because the data may reveal trade secrets. However, the withholding of such information is subject to approval by the EPA and the Director of the MDWPC.

Facilities that are designed to pretreat wastewater before discharge to a sewer must be approved by the MDWPC. For this purpose, an engineering report should be submitted for review and approval. The engineering report can be a valuable resource material for updating the data base.

The MDWPC samples and monitors NPDES permitted discharges to insure permit compliance. In the case of municipalities, where the NPDES requirements are not being met, the MDWPC will aid the municipality by sampling and monitoring discharges to the sewer system that may be causing the problem. Both these programs would be a valuable source of information. However, as previously noted, sampling data may be restricted for several reasons.

Local Community - Applications for an industrial connection to a local sewer system contain information on flows, effluent characteristics, and pretreatment facilities. In some cases, the local community may have information concerning the existing discharger, where circumstances have required that this information be obtained.

Local communities may have also undertaken an industrial waste survey which quantifies the industrial waste load as well as its individual discharge characteristics. Such information is usually available from either Facility Planning (201) or Industrial Sewer User Charge reports.

Miscellaneous - There are several sources of information which can be helpful in determining the accuracy of the data base. Although information concerning industrial discharges are not directly available from these sources, they can be used to indicate a changing industrial situation.

The Massachusetts Division of Employment Security tabulates industries by SIC code within each municipality. They also obtain employment figures within each SIC code activity. However, a particular industry may request that its employment statistics be made public for competitive reasons. Review of this source of data may indicate an increase in the number of firms in a particular SIC code activity, indicating that a new industry has been located in the town. Conversely, a decrease in the number of firms would indicate that an existing industry has moved or gone out of business.

The Associated Industries of Massachusetts maintains a Directory of Massachusetts Manufacturers. While all industries are not included in the Directory, it is a valuable source for identifying the major industries within each municipality.

Various water utilities provide all or part of the industrial water demand and for billing purposes they maintain consumption records. Comparison of present water consumption records with past records may indicate an expanded or revised industrial activity at any particular plant.

While none of the noted sources of information would provide a complete definition of the industrial discharge situation at any particular plant, in the aggregate they may come fairly close in achieving this objective. At a minimum, significant dischargers should be definable.

Information from various sources will become available at a non-scheduled or scheduled interval. Data from the miscellaneous sources normally becomes available on an annual basis. For these reasons, a continuous updating of the data is not warranted. Accordingly, updating the data base on a semi-annual or annual basis would appear adequate for the needs of the planning area.

Availability of Information - Information from the identified sources is generally available to the public, with some restrictions in several cases. The restricted areas concern employment figures as developed by the Massachusetts Division of Employment Security and certain NPDES sampling and monitoring information undertaken by the MDWPC.

5. Use of the Data Base. The data base can be used as an aid in the preliminary design of wastewater treatment plants, development of sewer use ordinances, sewer use charges, enforcement of water quality regulations and in defining pretreatment requirements.

One of the advantages of the data base is that it offers to the regulatory agencies, engineer, or concerned municipal officials a list of known significant, possible significant and non-significant industries within each municipal area.

The main benefit of maintaining a data base will accrue to the municipalities within the MAPC region. Individual municipalities have neither the authority nor the funding to maintain a data base of the scope developed in this study, therefore, the maintenance of such a data base becomes a regional or state responsibility.

To facilitate the updating process and to maximize use of the data base by local and private officials, computerization of the data base would appear to be essential.

Computerization would allow for quick and easy compilation of industries by any parameter or combination of parameters desired. Industries could be listed as to location, SIC code, product, specific pollutants discharged, or any other selected parameter. From these listings it would be easy to identify pollutants common to certain industries, areas or river basins, estimate what quantity of flows can be expected from specific industrial activities, and answer many other questions which may arise regarding industrial discharges. This data could greatly reduce the amount of work required in any future studies by supplying known data on previously surveyed industries. From this data certain inferences could then be drawn regarding the discharges of other industries with similar production processes.

To accomplish this computerization process, some form of data base management system should be obtained. One such system currently on the market with the capabilities to handle the data base from this study is referred to as the Data Retrieval System (DRS). This retrieval system may be used on computers or time-sharing systems by programmers or non-programmers. However, creation of the initial file of data must be performed by experienced personnel.

Purchase price of the DRS needed to handle the data base from this study is approximately \$19,000 and includes instrumentation, training and documentation. Estimated cost of compiling the initial file of data is \$3,000. If funds are not available to purchase the DRS, the system may also be leased or rented on a monthly basis.

Many conclusions have already been drawn for certain industrial groupings and SIC code classifications based on general data for the broad purposes of this study. However, more detailed studies may require the knowledge of the more specific and complete data found in the data base. Computerization could provide the flexibility and speed required to make the data readily available in a form tailored to meet the needs of any given municipality.

V. RECOMMENDED SEWER USE ORDINANCES

A. General

The purpose of this section is to present a basic model sewer use law that may be used by member communities of the MAPC. The model sewer use law delegates a large degree of responsibility to a superintendent or other responsible authority. This is done since each community will need to adjust the basic model sewer use law to meet its own particular needs.

B. Method of Approach

Model sewer use laws as developed by the Water Pollution Control Federation (WPCF) and the Massachusetts Division of Water Pollution Control (MDPWC) were first reviewed and compared. Based on this review, the most applicable and desirable features of each model sewer use law were identified.

Local sewer use laws were then identified and evaluated in relation to the model sewer use laws previously reviewed and to local needs.

A proposed model sewer use law was then developed taking into account the existing situation within the MAPC area, and the need for sewer use regulation.

C. Model Sewer Use Law

The proposed model sewer use law is presented at the end of this section. The law contains nine sections and is organized in the form of an ordinance. The law is based on the 1968 WPCF Manual of Practice and incorporates acceptable portions of the 1975 WPCF Manual of Practice and local requirements.

In light of the rapid changes now being experienced in identifying the effect of particular discharges to a wastewater collection system, the proposed rules and regulations should be updated as required.

Since much of the regulation is left in the proposed law to the discretion of a superintendent or other responsible authority, supplemental rules may be adopted to fit local conditions. Correspondingly, the delegation of such authority requires that each municipality or region appoint a knowledgeable sewer ordinance administrator. In small towns this may constitute a problem, but this

difficulty may be mitigated by relying on a regional authority such as the MAPC to act as a clearinghouse for distributing available current information.

The proposed ordinance should be reviewed by municipal counsel before adoption to determine that the document is legally acceptable and enforceable.

D. Need for Sewer Use Law

The WPCF Manual of Practice on Regulation of Sewer Use* states that there are three basic reasons for establishing a sewer use law:

- 1) Privies, septic tanks, cesspools, open sewer outlets and other hazardous and noisome methods of waste disposal shall not be permitted to exist where the public sewer system is available for service;
- 2) The public wastewater collection and treatment facilities shall be used in a manner consistent with the purposes and capacities for which such facilities were designed; and
- 3) No use of the municipal facility shall be permitted that may result in physical damage to the structures, interference with operation or unreasonable maintenance and expense.

To accomplish the objectives stated in Section 1, a model sewer use law should include a section requiring that all abutting property owners connect to an existing sanitary sewer within a specified time.

Under Section 3 of Chapter 83 of the Massachusetts General Laws, the authority for requiring connection to a public sewer is vested in the local board of health. Probably for this reason, the state model sewer use law, as most local ordinances, does not include a section requiring connection to a public sewer within a specified time.

Since the authority for requiring connection to a sewer is already vested in the local board of health, and since we do not believe it reasonable to require in all cases immediate connection to a public sewer system, we have not included such a regulation in the model sewer use law presented in this chapter.

Although the objectives stated in Sections 2 and 3 are simply stated, the identification of harmful substances can be extremely difficult particularly in the case of industrial discharges. In a broad definition, harmful substances can include not only those materials that cause physical damage, but also that will disrupt the treatment process or will not permit the local municipality or region to meet its NPDES permit requirements. Since different treatment processes have different capabilities for removing various substances, the ultimate determination of the loads that may be imposed on a specific sewer system and wastewater treatment plant must rest with the local or regional authorities.

* Manual of Practice No. 3: Regulation of Sewer Use, Water Pollution Control Federation, 1975.

In drafting a model sewer use law, this problem has been recognized. Generally those materials that have been well identified as causing or having the potential to cause disruption of most treatment processes or physical damage to any part of the sewer system or plant have been excluded or limited in the model sewer use law.

To guide the concerned municipalities in the exclusion of other harmful materials, a discussion of present practices and rules and regulations both federal and state on excluding harmful materials is included in this chapter.

E. Organization and General Contents of Model Sewer Use Laws

Model sewer use laws are generally organized as follows:

- 1) Introduction;
- 2) Definitions;
- 3) Building Sewers and Connections;
- 4) Use of the Public Sewers;
- 5) Protection from Damage
- 6) Powers and Authority of Inspectors;
- 7) Enforcement (penalties);
- 8) Validity;
- 9) Ordinance in Force.

The introduction is a brief statement of the purpose, provisions of penalties and jurisdiction of the ordinance.

The definitions section defines the meaning of terms used in the ordinance.

The building sewers and connections section defines persons authorized to make connections, methods of applying for permits and allocates the cost and expenses for the installation of the sewer connections to the owners. This section of the ordinance is normally deficient in specifying acceptable materials and construction practices. As discussed later in this chapter, to correct this deficiency, it is recommended that each town adopt a drain layer's manual, as a supplement to the proposed model sewer use law.

The use of the public sewer section is the heart of the ordinance. In this section, the quantities and characteristics of wastewater that may enter the sewer system are defined, generally banning the entrance of deleterious materials and discharges of cooling waters, storm runoff and slug flows. This section makes provision for requiring pretreatment facilities at the discretion of the superintendent or other responsible authority. The section may or may not require in the case of industrial discharges, the monitoring of wastewater by the owner.

The protection from damage section covers malicious, willful and negligent damage to the wastewater collection and treatment facilities. If there are other adequate regulations covering the destruction of public property, then this section may be eliminated from the model sewer use ordinance.

The powers and authority section permits the superintendent and other duly authorized employees to enter private property and to undertake such monitoring, sampling and testing pertinent to discharge to the municipal system.

The enforcement section establishes penalties for violations of the provisions of the ordinance and should be included to make the ordinance effective against willful violators.

The last two sections - Validity and Ordinance in Force - are designed to meet certain legal requirements that will insure the validity of the ordinance as well as put it in force. These sections, and the entire ordinance, should be reviewed by a municipal authority or counselor to guarantee that the ordinance is a legally effective document.

F. Review of Local Ordinances

Within the MAPC area, outside that area under the jurisdiction of the MDC, there are 21 towns that have established or are in the process of establishing sewer use ordinances. Three towns (Lynn, Nahant and Saugus) which have extensive sewer systems, have not established sewer use ordinances but do meet federal requirements, will be required in the near future to do so.

The SESD has developed a sewer use law for its constituent communities, even though all of the communities within the SESD have their own sewer use laws. Where the ordinances conflict, the more stringent requirements prevail.

A list of communities and regional authorities that have established sewer use ordinances is presented in Table 3-16.

As indicated in Table 3-16, most of the communities have established ordinances that are similar to the 1974 MDWPC model sewer use law. Those that have not, have adopted a short form that regulates the installation of sewer connections, and in some cases, limits certain discharges to the public sewer system. The short form is considered inadequate.

Our review indicates that most of the local ordinances should be updated to include the desirable features of the 1975 WPCF Manual of Practices.

It is further indicated that the building sewers and connections section of the local ordinances does not adequately define acceptable materials and construction procedures for providing house connections. This deficiency is probably best remedied by each community adopting a supplemental drain layer's manual for the installation of household connections. There is an advantage in developing a uniform drain layer's manual that may be adopted for use throughout the MAPC area. The development of a proposed drain layer's manual is discussed and presented later in this chapter.

As proposed in the 1974 MDWPC model sewer use law, limitations for toxic pollutants within the local ordinances are usually established by the superintendent. The exceptions are the sewer use ordinances that are in effect in

TABLE 3-16 IDENTIFICATION OF SEWER USE ORDINANCES

Municipality	Ordinance similar to MDWPC Ordinance	Ordinance not similar to MDWPC Ordinance
Regional		
SES	X	
Community		
Beverly	X	
Cohasset	X	
Concord	X	
Danvers	X	
Franklin	X	
Hudson	X	
Hull	X	
Manchester		X
Marblehead	X	
Marlborough	X	
Marshfield	X	
Maynard	X	
Medfield	X	
Medway	X	
Milford		X
Millis	X	
Peabody	X	
Rockland	X	
Salem	X	
Scituate	X	
Swampscott		X

Cohasset, Medway, and within the MDC area. In these cases, the discharge of heavy metals up to the solubility of the oxide or hydroxide of the heavy metal is permitted. Within the context of the characteristics of effluent discharges presently attainable by existing industries who treat plating wastes, these latter requirements may be too stringent.

The question of acceptable limits of toxic discharges (heavy metals, etc.) is usually site specific, depending to some extent on the type of treatment provided, the type of aquabiological life that must be maintained in the receiving waterbody, and the use of the receiving waterbody. For this reason, toxic limitations within discharge areas containing shellfish may be more stringent than discharge to upland waters. Given the uncertain state of the present definition of acceptable limits of toxic wastes, it appears to have some advantage to permit the superintendent or other responsible authority to set such limits. This would permit the local municipality to respond to the needs of their particular treatment process and discharge requirements. For these reasons, the proposed model sewer use law does not set specific limitations for toxic pollutants.

G. Toxic Pollutants

Toxic pollutants can generally be classified as inorganic or organic in nature.

Inorganic pollutants generally consist of the heavy metals that can be harmful to the treatment process itself or the propagation of aquatic life within the receiving stream. Within the study area, heavy metals are discharged by those industries who undertake plating either as a primary or captive activity. Current practice is to discharge the rinse solutions from the plating operations to the local sewers. The more concentrated plating solutions are usually disposed of by private disposal contractors.

Table 3-17 presents guideline limiting values for inorganic discharges that have been taken from several sources.

The MDWPC has published a list of suggested discharge concentrations for heavy metals as shown in Table 3-17. The MDWPC obtained these values by evaluating the effluent characteristics from approximately 40 industries who pretreat their wastes before discharging to a local sewer or waterbody.

At the present time, the Environmental Protection Agency has established an effluent standard for discharge to local sewers for one of the listed chemicals (Chromium, valence +6).

To give some guidance as to an acceptable level of concentration that may be tolerated at a secondary biological treatment plant, Table 3-17 indicates the percent removal that may be expected in a secondary treatment process, and the level of discharge that would be acceptable to maintain aquatic life and/or the use of the receiving water as a water supply source.

In 1977, the MAPC undertook a chemical analysis of the influent and effluent characteristics of 15 wastewater treatment plants within the study area. This analysis included six of the chemicals listed in Table 3-17. The six chemicals are cadmium, lead, zinc, nickel, copper and chromium. The survey indicated that with the exception of one plant, all meet the municipal discharge criteria listed

TABLE 3-17 LIMITING VALUES OF INORGANIC DISCHARGES - mg/L

Chemical	Discharge to sewers		% removal in secondary biological treatment(1)	Municipal discharge	
	MDWPC	EPA		EPA(2)	MDWPC
Aluminum	0.50	-	-	-	0.50
Barium	2.00	-	-	1.00(4)	2.00
Cadmium	0.20	-	17	0.0004(3) 0.01(4)	0.20
Chromium (+6)	0.05	.25	-	0.10(3)	0.05
Chromium (total)	0.50	-	46	0.05(4)	0.50
Copper	0.50	-	57	1.00(4)	0.50
Fluoride	18.00	-	-	-	18.00
Iron	1.00	-	63	1.00(3) 0.30(4)	1.00
Lead	0.10	-	39	0.05(4)	0.10
Manganese	2.00	-	38	0.10(3) 0.05(4)	2.00
Mercury	-	-	39	0.00005(3) 0.002(4)	-
Nickel	2.00	-	20	-	2.00
Silver	0.05	-	-	0.05(4)	0.05
Tin	1.00	-	-	-	1.00
Zinc	0.50	-	58	5.00(4)	0.50

1. Federal guidelines for State and local Pretreatment Programs (Volume I), U.S. Environmental Protection Agency, January 1977.
2. Quality Criteria for Water, U.S. Environmental Protection Agency, 1976.
3. Based on protection and propagation of aquatic life.

in Table 3-17. One of the plants had an effluent that had a lead content which slightly exceeded the allowable discharge limits as established by the MDWPC.

Organic pollutants consist of a wide range of organic chemicals and include the pesticide group. Table 3-18 indicates limiting discharge concentration values that have been established by various regulatory agencies.

Because of the severe limiting values, most of the listed chemicals are best excluded from any sewer systems.

H. Drain Layer's Manual

One of the major deficiencies in most model sewer use laws is that the construction of building and house connections is inadequately specified. For this reason, a drain layer's manual would be a valuable supplement to a model sewer use law.

A drain layer's manual would include the following:

- 1) Provide a licensing system to help insure that only qualified personnel are allowed to lay sewer pipe or install building connections;
- 2) Provide material specifications for sewer pipes, joints and fittings;
- 3) Define the method of construction including trench sheeting, pipe slopes, backfill operations and acceptable pipe laying techniques; and
- 4) Provide an inspection and testing procedure.

A sample drain layer's manual is presented at the end of this section. This sample manual has been taken from a drain layer's manual that is presently in use within the Metropolitan District of Hartford, Connecticut with some editing to make it more applicable for the control of sewer house connections within the MAPC area.

VI PRETREATMENT GUIDELINES FOR THE TANNING INDUSTRY

A. General

One of the major sources of industrial waste discharge within the MAPC area is the tanning industry. The data base indicates that there are 61 industries within the study area engaged in the Leather Tanning and Finishing Industry. Of these, 13 have been identified, based on available data, as significant industries. Significant industries are defined as those that discharge a minimum of 50,000 gallons of wastewater per day, or are known to discharge harmful materials. Most

* Drain Layer's Manual, the Metropolitan District, Bureau of Public Works, Hartford, Connecticut, 1971.

TABLE 3-18 LIMITING VALUES OF ORGANIC DISCHARGES - mg/L

Chemical	Discharge to sewer		Discharge to water body		Municipal discharge EPA (1)
	MDWPC	EPA	EPA		
Cyanide (dest. by Cl ₂)	0.05	0.20	-	-	-
Cyanide (total)	0.05	0.64	-	-	0.005(2)
Benzidine	-	-	0.05 (A) 0.025 (B)	-	-
Phthalate esters	-	-	-	-	0.003(2)
Polychlorinated biphenyl's (PCB's)	-	-	0.0 (A)	-	0.00001(2)
Phenol	-	-	-	-	0.001(2)(3)
Pesticides					
Aldrin-dieldrin	-	-	0.0 (A) 0.0 (C)	-	0.000003(2)
Chlordane	-	-	-	-	0.00001(2)
DDT	-	-	0.0 (A) 0.0 (C)	-	0.000001(2)
Demeton	-	-	-	-	0.0001(2)
Endosulfan	-	-	-	-	0.000003(2)
Endrin	-	-	0.0075 (Aa) 0.0005 (Ab) 0.0 (C)	-	0.000004(2) 0.0002(3)
Guthion	-	-	-	-	0.00001(2)

TABLE 3-18(Continued). LIMITING VALUES OF ORGANIC DISCHARGES - mg/L

Chemical	Discharge to sewer		Discharge to water body	Municipal discharge
	MDWPC	EPA	EPA	EPA(1)
Heptachlor	-	-	-	0.000001(2)
Lindane	-	-	-	0.00001(2) 0.004(3)
Malathion	-	-	-	0.0001(2)
Methoxychlor	-	-	-	0.00003(2) 0.10(3)
Mirex	-	-	-	0.000001(2)
Parathion	-	-	-	0.00004(2)
Toxaphene	-	-	0.0075 (Aa) 0.0005 (Ab) 0.0 (C)	0.000005(2) 0.005(3)
Chlorophenoxy herbicides				
2, 4-D	-	-	-	0.10(3)
2, 4, 5-TP	-	-	-	0.01(3)

1. Quality Criteria for Water, U.S. Environmental Protection Agency, 1976.

2. Based on protection and propagation of aquatic life.

3. Based on use as a water supply source.

A - Manufacturer

B - Applicator

Aa - Existing manufacturer

C - Formulator

Ab - New manufacturer

of these industries are located in Salem and Peabody. In addition, one large tannery is located in Danvers.

This chapter discussed and develops pretreatment guidelines for the local tanning industry.

B. Sources of Wastewater Discharges

There are four basic operations in the tanning industry:

- 1) Beamhouse;
- 2) Tanhouse;
- 3) Retan, color and fat liquor;
- 4) Finishing.

A tanning industry may perform one or more of these basic operations. Therefore, it can be anticipated that the characteristics of the wastewater discharges can vary widely within the industry.

A flow diagram for the leather tanning and finishing industry is shown in Figure 2-1. Typical wastewater characteristics are discussed in the following paragraphs.

1. Beamhouse. This operation produces a significant amount of high strength wastewater. This wastewater may have a high biochemical oxygen demand (BOD) along with a high total suspended solids (TSS), grease and sulfide content. Also, the wastes characteristically have a high pH value because of the lime used.

2. Tanhouse. If chrome tanning is employed, the wastewaters may contain a high concentration of valence 3 chromium. If vegetable tanning is employed, very little wastewater is discharged from the process. This is because water conservation practices are normally used and the only wastewater discharged is from drag-out at the tanning vats.

3. Retan. This process usually produces a high volume, medium to low strength waste with a temperature in excess of 100 deg. F. The wastewater will contain BOD, suspended solids, valence 3 chromium, and oil and grease. However, the concentrations of these pollutants are such that they will not add a significant quantity to the total waste flow.

4. Finishing. The finishing process is a dry process, and very little, if any, wastewater is discharged.

C. Significant Pollutants in Tanning Industry Discharges

The major pollutants discharged by the tanning industry are BOD, TSS, sulfides, oil and grease and valence 3 chromium.

According to the EPA*, "Performance data for joint publicly-owned treatment works that are treating leather tanning wastes indicate that where treatment systems are properly designed to handle this specific waste, the major pollutants are removed to consistently low concentrations, and therefore, do not pass through a publicly-owned treatment works." Publicly-owned treatment works are assumed to provide secondary treatment (primary plus biological secondary treatment).

Areas of concern are mainly centered around proper operation of the wastewater collections systems. According to the EPA*, sulfide can generate potentially dangerous quantities of hydrogen sulfide at a pH below 7.0. Optimum removal of valence 3 chromium is achieved in a primary clarifier at a pH range between 8 to 10 with acceptable removal at pH 6. For these reasons, the EPA pretreatment standards limit all discharges from the tanning industry to a pH range of 6.0 to 10.0 with no beamhouse activity and from 7.0 to 10.0 with beamhouse activity (sulfide wastewaters).

Total suspended solids and oil and grease can present a problem in the operation of the wastewater collection system.

Land disposal of sludge that contains valence 3 chromium must be carefully controlled to insure that acidic conditions will not develop, since under these circumstances valence 3 chromium may be oxidized to hexavalent chromium which is toxic. Incineration of sludges containing valence 3 chromium may also generate some hexavalent chromium. At present the EPA has not established guidelines for the disposal of sludges containing valence 3 chromium since the problem is site specific and a national problem has not been identified.

D. Current Federal Guidelines

In the March 23, 1977 issue of the Federal Register, the EPA set the following pretreatment standards for existing leather tanneries.

- a) No pollutant (or pollutant property) introduced into a publicly-owned treatment works shall interfere with the operation or performance of the works. Specifically, the following wastes shall not be introduced into the publicly-owned treatment works:
 - 1) Pollutants which create a fire or explosion hazard in the publicly-owned treatment works.
 - 2) Pollutants which will cause corrosive structural damage to treatment works, and in no case pollutants with a pH lower than 6.0 or greater than 10.0 unless the works are designed to accommodate such pollutants.**
 - 3) Solid or viscous pollutants in amounts which would cause obstruction to the flow in sewers or other interference with the proper operation of the publicly-owned treatment works.

* Federal Register, Vol. 42, No. 56 - Wednesday, March 23, 1977.

** pH requirements vary with different tanning processes.

- 4) Pollutants at a flow rate and/or pollutant discharge rate which is excessive over relatively short time periods so that there is a treatment process upset and a subsequent loss of treatment efficiency.
- b) Any owner or operator of any source to which the pretreatment standards required by (a) are applicable, shall be in compliance with such standards upon the effective date of that subsection.

Under these regulations only pH is specifically regulated. All other discharge characteristics will have to be regulated by the municipality through either a sewer ordinance or by the local superintendent.

E. Existing Situations

From the industrial waste survey of the MAPC study area, the tanning industry was found to be located primarily in the municipalities which comprise the South Essex Sewerage District (SESD). Data on known effluent characteristics of seven firms is provided in Table 3-19. Included in the table are firms which perform tanning and/or retanning or dehairing and liming of hides.

The model sewer use ordinance developed for this study, as well as the SESD ordinance, requires a pH range of 5.5 to 9.5 and a maximum oil and grease content of 100 mg/L for wastewaters discharged to the sewer system. In addition, the SESD ordinance has set a limit of 500 mg/L on the discharge of total suspended solids. Neither ordinance establishes a limit for sulfides or valence 3 chromium. Table 3-20 presents a comparison of the actual discharge characteristics of several tanning firms in the study area with the limitations established by the SESD.

As indicated in Table 3-20, many of the industries are not entirely meeting the limitations established by the SESD.

At the present time the SESD is undertaking the construction of a primary treatment plant which will include facilities for sludge incineration. A 201 Facilities Plan Study that will consider the expansion of the primary treatment plant to a secondary treatment plant is now underway.

As previously reported, the SESD sewer ordinance requires that the TSS and oil and grease be limited to concentrations of 500 mg/L and 100 mg/L, respectively. Given the present standards, these particular constituents should not provide difficulties within the wastewater collection and treatment system.

Studies undertaken for a report* indicate that under existing conditions the pH of the influent to the proposed plant can range between 6.7 and 9.0 with a mean value of 8.2. Accordingly, the removal of valence 3 chromium within the primary process should not present a problem.

* Report to South Essex Sewerage Board, Salem, Massachusetts, upon Additions and Improvements to Sewerage System, Metcalf & Eddy, Inc., March 6, 1969.

TABLE 3-19 DISCHARGE CHARACTERISTICS TANNING INDUSTRY

Location	Type of process	Q, gpd	BOD, mg/L	TSS, mg/L	pH	Oil and		Sulfides, mg/L	Treatment
						Chrome, mg/L	grease, mg/L		
Peabody	Retanning	10,000	800	629	-	0.4	82	0.5	Settling
Peabody	Dehairing and liming	50,000-150,000	11,500	4,600	11.95	0.4	321	495	Settling
Peabody	Tanning	>50,000	1,244	1,387	10.2-12.3	35	325	142	-
Peabody	Tanning, retanning, and finishing	600,000 (includes cooling water)	1,297	541	9.4	14.1	85	-	None
Salem	Tanning and retanning	78,000	250	225	4.1	109	553	-	Settling and grease and solvent recovery
Salem	Tanning	>50,000	1,013	5,168	6.0-11.3	26	101,478	20	Settling
Peabody	Tanning	133,000	979	1,975	7.5-10.5	158	318	62	-

TABLE 3-20 COMPLIANCE OF TANNING INDUSTRY DISCHARGES
WITH SEDD ORDINANCE

Location	Type of process	TSS	pH	Oil and grease
Peabody	Retanning	X		*
Peabody	Dehairing and liming	X	+	X
Peabody	Tanning	X	+	X
Peabody	Tanning, retanning, and finishing	X	+	*
Salem	Tanning and retanning	*	-	X
Salem	Tanning	X	+	X
Peabody	Tanning	X	+	X

X - Not meeting SEDD limitations
 * - Meeting SEDD limitations
 + - pH value higher than SEDD limitations
 - - pH value lower than SEDD limitations

Sulfides are largely generated within the tanning industry by those industries that have a beamhouse process (dehairing and liming of hides). Industrial sources indicate that within the New England area dehairing and liming of cattle hides is no longer an economical process, and accordingly, the existing industry tends to purchase processed hides from out-of-state sources for tanning, retanning, and finishing in Massachusetts. Up to the present time, the SESD has not reported difficulties with hydrogen sulfide production within its collection system. This is probably due to the pH of its wastewaters.

Accordingly, it is doubtful if there is a need for pretreatment standards for the removal of valence 3 chromium or sulfides for the proper operation of the treatment plant or the protection of the wastewater collection systems.

Sulfides in a primary treatment plant are not oxidized and accordingly have a high chlorine demand. The SESD chlorination system is designed to minimize the use and correspondingly the cost of chlorine. However, if experience indicates that this procedure is not cost-effective, then the tanning industry may be required to oxidize sulfides at the source.

A site has not yet been selected for landfilling of the ash resulting from the sludge incineration process. Since incineration of sludges containing valence 3 chromium may generate hexavalent chromium, there is some need for careful investigation and control of any landfill site to insure that the groundwater is not polluted.

F. Pretreatment Guidelines

As previously discussed, the major constituents of the wastewaters that need to be controlled within the tanning industry are the grease and oil content and the TSS. The following pretreatment guidelines have been adopted by the SESD and are applicable to the SESD communities.

Grease and oil that originates in the tanning industry consists of animal fat that is readily removed by a flotation process. A limitation for these constituents of 100 mg/L does not appear to be an excessive requirement and should insure the proper operation of the wastewater collection system.

A TSS concentration of 500 mg/L is also recommended. However, it is further recommended that where necessary, fine screens be provided to remove hair, scraps, and fibers.

Although the pH of the wastewaters in the SESD system is at acceptable levels, Table 3-19 indicates that the discharge from some tanneries does not meet SESD pH standards. This indicates that there is some need for pH adjustment before the wastewaters are discharged to the wastewater collection system.

In some instances, flow equalization may be required. Our information indicates that some of the local tanning industries operate only during those periods when the price of raw hides is acceptable, and then only on a part-time basis. Under such operating conditions, wastewater discharges may be sporadic in nature, particularly during start-up and stop operations. To even

out wastewater discharges during these periods, flow equalization may be required. To identify the need for flow equalization facilities, discharge metering should be required.

VII FINANCIAL AND MANAGEMENT FACTORS

A. Enforcement Strategies

Nationwide, industry has been much more successful in complying with effluent limitations based on best practicable control technology than municipalities have been in meeting the secondary treatment standard. All but about 14 percent of the major industrial dischargers met the July 1, 1977 deadline. EPA's enforcement strategy for non-complying industries will be to first address those dischargers whose effluents have adverse effects on public health and those dischargers whose conduct to date has the earmarks of bad faith. In these cases, EPA has indicated that they will be seeking penalties commensurate with the economic benefits of delayed compliance, as well as court imposed compliance schedules.

EPA had proposed, as part of the Clean Water Act of 1977 a "non-compliance fee" provision which would have allowed the administrative assessment of a non-compliance fee against any point source (other than publicly-owned treatment works) which is not in compliance with discharge limitations set under the Act. The non-compliance fee would have been commensurate with the economic benefits of delayed compliance, including planning costs, design costs, supply costs, capital costs and costs of capital over a normal amortization period not to exceed ten years, start-up costs, operation and maintenance costs and other factors deemed appropriate. This proposal was similar to the "noncompliance penalty" provisions enacted into the Clean Air Act Amendments of 1977 (sec. 118). However, the "noncompliance fee" proposed was not enacted as part of the Clean Water Act of 1977. The requirements for the automatic, rather than discretionary, imposition of this fee contributed to its downfall.

Another often mentioned proposal for controlling discharges through an economic incentive program is through a system of effluent charges or a tax on pollutants. The proceeds from these charges would constitute a rent on a scarce resource to society which could be used in a variety of ways, including the funding of measures to improve water quality. By supplying a profit advantage it gives industry an incentive to abate pollution at its source. The effluent charge would not become a license to pollute as long as the charge is set higher than the cost of abatement. Additionally, it would provide a continuing incentive which operates even after the standards are met as new technology develops new ways of avoiding the charge. An effective system of effluent charges would be based on an accurate identification of the "damage cost function", which is the functional relationship between the amount of waste discharged and damages. This would create some problems in administration since the damaging effect on a given waste discharge is heavily dependent upon the natural environment conditions which exist when the discharge is made. In other words, the first step is establishing the connection between a particular pollutant and the water quality impact. It is this very problem of determining water quality impacts that led, in 1972, to the amendment of existing water pollution control laws, based solely on water quality

standards. Effluent charges would further complicate this problem by requiring the establishment of a fee schedule for every industry which is higher than the cost of cleaning up the water. To gather all the necessary information to establish such a system would be a monumental task in itself. In addition there would be significant problems in the administration of such a system. Even a tax must be enforced, which would place additional burdens on the IRS. It is possible that the greatest beneficiaries of such a system would be the tax lawyers. It is possible that the Treasury Department would view an effluent tax as a revenue raising measure, and therefore seek to keep the assessment low enough to generate taxes and not reduce pollution.

It is recommended that the present regulatory scheme, including the "mid-course corrections" made by the Clean Water Act of 1977, not be further complicated by an involved, and possibly ineffective economic incentive program. Industry is just becoming familiar with the present system, and there is every indication that it is achieving its goals. The present system of NPDES permits, user charge and industrial cost recovery requirements insures that industry pays to clean up its own wastes. If further action is needed to eliminate the economic incentive of noncompliance then a "noncompliance fee" provision may be appropriate. As noted above, this measure was rejected at the federal level, but could be instituted at the state level if it was determined that industries in the Commonwealth were benefitting from delayed compliance. It should be pointed out that with present inflationary trends delayed compliance will result in higher capital construction costs for treatment facilities in the future. EPA has indicated that the second generation of NPDES permits will more effectively deal with the problems of toxic pollutants, particularly organic chemicals.

As noted earlier in this report, EPA and the Massachusetts Division of Water Pollution Control issue joint NPDES permits. Therefore, the industrial control strategy for the state will be controlled by EPA control strategy. One area where Massachusetts does exercise some discretion is in the enforcement action that it undertakes on its own through the Attorney General. Recent enforcement action has relied to a great extent, and with apparent success, on the use of preliminary injunctions and consent decrees. This approach allows the enforcement response to vary based on the nature and seriousness of the violation, and preserves cooperative relations with violators, thereby encouraging voluntary compliance.

B. Incentives for Voluntary Compliance

The ability of the Federal-State-areawide effort to prevent and abate water pollution will depend in large part upon the extent to which private industry voluntarily complies with pollution control standards and the effectiveness of Government action in obtaining such compliance. While the Federal government and the Commonwealth administer regulatory programs to limit discharges into waterways and affecting groundwater, they also offer a variety of financial assistance programs to induce industrial and commercial businesses to acquire or construct pollution control systems. Federal and state tax benefits and financing programs reduce and soften the effect of investing in pollution control facilities. Tax benefits reduce and postpone tax liability through the investment credit, rapid amortization, and exemptions from the property tax. Tax-exempt industrial revenue bond financing and small business loans and lease guarantees reduce the cost of financing.

Section 169 of the Internal Revenue Code permits pollution control facilities to be amortized over a five year period. The major requirements for eligibility of pollution control facilities under section 169 are as follows:

- 1) The pollution control facility must be used to "abate or control water...pollution or contamination by removing, altering, disposing, storing or preventing the creation or emission of pollutants, contaminants, wastes or heat..."
- 2) The facility does not significantly "increase the output or capacity, extend the useful life, or reduce the total operating costs of such plant or other property (or any unit thereof), or... alter the nature of the manufacturing process or facility."
- 3) It includes only tangible property which is of a character subject to depreciation under s. 167 of the Code, which is identifiable as a treatment facility.
- 4) It is constructed, reconstructed, erected or acquired after December 31, 1968.
- 5) It is used in connection with a plant or other property in operation before January 1, 1976.
- 6) It must be certified by state and federal certifying agencies (in Massachusetts, the Division of Water Pollution Control and the Environmental Protection Agency, Region I). EPA will not certify unless use of the facility is in compliance with all applicable water quality standards.

In addition, section 46 of the Code makes an investment credit available for up to 50 percent of the qualified investment in pollution control facilities. This provision may be used in conjunction with section 167 or a company may take the full investment credit plus straight-line or accelerated depreciation. No certification is necessary for the accelerated depreciation deduction-investment credit option.

There are a few disadvantages to these tax incentive provisions. First, the rapid amortization of s. 169 is not available for "any device which is part of a disposal system for subsurface injection of inadequately treated industrial or sanitary wastes or other contaminants." Secondly, only expenditures for equipment and other depreciable tangible property qualifies. Costs incurred in changing methods of operation would not qualify. Finally, the incentives are structured in such a manner that a company must have a sufficient level of pre-tax income to benefit from them. The small business with a low income level and the unprofitable business with an old inefficient and polluting plant, just those businesses which are most in need of assistance, would benefit least from these tax incentives.

Under the Massachusetts corporate income tax, a 100 percent deduction is available for expenditures incurred during the taxable year for investment in industrial waste treatment facilities. This amounts to treating the expenditures as an ordinary and necessary expense.

Furthermore, under Massachusetts law, there is an exemption from local property taxes for "any structure, buildings, equipment or other property..." installed or constructed for the purpose of abating industrial pollution.

To be eligible for this exemption, a taxpayer must receive certification from the Division of Water Pollution Control that the property "is effective in eliminating or reducing pollution to an acceptable level."

An increasingly popular method of financing pollution control systems is through industrial development revenue bond (IDRB) financing. Pursuant to IRC section 103 (c)(4)(F), a municipality may market tax-free municipal bonds for the purpose of purchasing or constructing air or water pollution control facilities which may then be leased or sold to private industry.

The benefits of this financing technique to a private firm are three-fold. First, 100 percent of the funds required for the acquisition of the equipment plus the cost of issuing the bonds can be financed. Second, because the purchaser earns interest on the bonds which is exempt from federal and Massachusetts income taxes, the interest the business-lessee incurs on the loan is considerably lower than conventional loan rates. Third, lease or sale arrangements with the municipality can be arranged so that other tax advantages can be retained or obtained.

The bondholder benefits in that the interest he receives on the bond is tax-exempt. The municipality obtains the benefit of cleaner water while keeping or attracting a tax-paying industry.

In order that a bond issue for pollution control be approved, the State Industrial Finance Board must find that:

- 1) Such a project will alleviate unemployment or the threat thereof in the municipality or provide security against future unemployment and lack of business opportunity in the municipality;
- 2) A substantial public benefit will result from the project;
- 3) DWPC has found that it is in furtherance of the purpose of abating or controlling water pollution.

It should be noted that this certification does not seem to require that the project be designed to satisfy any or all applicable standards.

In promoting the use of IDRB's for pollution control, it should be noted that the annual cost to the treasury from the reduction of tax liability is substantial, roughly \$500 million in 1976. Of this \$500 million, 35 percent would go in the form of interest savings to businesses to install pollution control systems. Sixty-five percent would be paid as a "premium" to holders of tax-exempt bonds, almost all of whom are high income individual and banks. IDRB financing is an inefficient and inequitable subsidy.

Another federal financing program designed to soften the effect of investing in pollution control facilities is the Small Business Water Pollution Control Loan Program. Section 8 of P.L. 92-500 amended Section 7 of the Small

Business Act by providing for loans to small business concerns for water pollution control systems. A company may qualify for water pollution control loans from the SBA if it:

- 1) Is a small business concern;
- 2) Is making additions to or alternations in its equipment or facilities or its methods of operations in order to meet water pollution control requirements;
- 3) Is likely to suffer substantial economic injury without assistance.

The problem with the SBA loan program is that a firm must be in sufficient financial difficulty so as to be unable to obtain a private loan on reasonable terms but has to be financially stable enough to assure repayment to SBA. Nevertheless, in FY 1974, SBA guaranteed participation in or granted loans for pollution control worth \$100 million.

The preceding discussion has attempted to briefly describe some of the existing tax incentives and financing programs available to industries in order to meet water pollution control requirements. For a more detailed discussion of these programs see Appendix B of MAPC's 208 report entitled "Areawide Water Quality Management Alternatives", January, 1978.

C. A Role for the 208 Management System

In the next several years, a new generation of NPDES permits will be issued, pretreatment standards will be established, public waste treatment may become more regionalized and industry will make decisions whether to discharge directly under an NPDES permit or to pretreat, pay industrial cost recovery and user charges, and discharge into a public waste treatment system. With stricter standards, many businesses will either have to change their methods of operation, or install pollution control equipment, or do both in order to comply with the law.

The 208 management system could improve voluntary compliance with the new requirements by disseminating basic financial and technical information to industrial firms.

The management agency responsible for this information function need not have any specialized capability. It should, however, be able to perform the following functions:

- 1) Inform firms of the basic P.L. 92-500 requirements, such as pretreatment, industrial cost recovery, user charges and NPDES effluent limitations;
- 2) Disseminate information on basic technical solutions to pollution problems, including process changes and recycling;
- 3) Direct interested individuals seeking technical assistance to the appropriate individuals or agencies;
- 4) Inform firms of the various tax and financing assistance programs for pollution control;

- 5) Direct interested firms to those individuals in the agencies responsible for certifications and approvals for these programs.

This information could be targeted to various types of industries or certain individual firms based on the economic, employment and discharge data being collected by MAPC's 208 engineering consultant (Metcalf & Eddy). In this manner, a firm could be assisted in complying with P.L. 92-500 requirements and, if there is unwillingness to take positive action, support can be mobilized to induce compliance.

The technical, financial and economic data could play an important role in both establishing NPDES permit and pretreatment requirements and in enforcing compliance with such requirements. Permits that are based on adequate technical, environmental, legal and economic data will more likely be complied with and if not, will be enforced more effectively. This data could also be utilized in establishing and implementing enforcement priorities and could play an important role if a case comes to trial. Where permit standards are reasonable and a firm was informed of various technical and financial steps it would take to comply but did not take adequate action, a court could determine that such a firm was not acting in good faith. This could be important in determining the amount of a fine or other penalty or relief. Conversely, if a firm was economically marginal and applied for an SBA loan, this could be taken into account as a mitigatory element.

In this manner, the various incentive programs could be utilized with the regulatory programs to increase their effectiveness while taking into consideration the valid economic interests of a locality and the region. As a by-product, the communication between the state and federal permitting divisions (the Division of Water Pollution Control-Industrial Section and EPA Region I, Permits Branch) and the enforcement agencies (EPA Region I, Enforcement Division and DWPC, and the federal and state Attorney General's offices), and the 208 management agency responsible for collecting, coordinating and/or disseminating information could be dramatically improved.

Another possible incentive program, or more appropriately, a disincentive program which is often discussed is the assessment and collection of non-compliance penalties. A non-compliance penalty is generally calculated on the basis of the costs a non-complying source avoids by delaying compliance. The calculation of the non-compliance penalty considers the capital costs of compliance and debt service over a normal amortization period, foregoing operation and maintenance costs, along with any additional economic value of a delay. In general terms, the penalty reflects the financial savings realized by a company as a result of non-compliance with the law. The Clean Air Act Amendments of 1977 have instituted such a program for violations of that act. While a similar provision was proposed for amending the Federal Water Pollution Control Act, it was ultimately rejected. However, the concept could be incorporated into some state environmental programs such as the Massachusetts Clean Waters Act. Enabling legislation would, of course, be required.

Earlier sections of this report noted the authority, at the federal and state level, to promulgate regulations regarding pretreatment standards. The EPA has done this for some industries to date. MAPC's 208 engineering consultant (Metcalf & Eddy) has suggested that municipal systems be allowed the flexibility to require pretreatment to the extent necessary to maximize the efficiency of their own treatment processes. Federal and state standards should

allow this flexibility. Sewer extension and connection permits by DWPC could be tailored to allow a measure of local discretion but still provide adequate regulatory control over the local pretreatment program. (A model sewer ordinance developed to permit this local flexibility in regulating discharges to municipal wastewater treatment systems follows.)

PROPOSED MODEL SEWER USE LAW

AN ORDINANCE REGULATING THE USE OF PUBLIC AND PRIVATE SEWERS AND DRAINS, THE INSTALLATION AND CONNECTION OF BUILDING SEWERS, AND THE DISCHARGE OF WATERS AND WASTES INTO THE PUBLIC SEWER SYSTEM(S); AND PROVIDING PENALTIES FOR VIOLATIONS THEREOF: IN THE CITY OF _____, COUNTY OF _____, STATE OF _____.

Be it ordained and enacted by the _____ of the City or Town of _____ State of _____ as follows:

ARTICLE I

Definitions

Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

Section 1. Biochemical oxygen demand (BOD) shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five (5) days at 20 deg. C, expressed in milligrams per liter.

Section 2. "Building drain" shall mean that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer, beginning five (5) feet (1.5 meters) outside the inner face of the building wall.

Section 3. "Building sewer" shall mean the extension from the building drain to the public sewer or other place of disposal, also called house connection.

Section 4. "Combined sewer" shall mean a sewer intended to receive both wastewater and storm or surface water.

Section 5. "Easement" shall mean an acquired legal right for the specific use of land owned by others.

Section 6. "Garbage" shall mean the animal and vegetable waste resulting from the handling, preparation, cooking, and serving of foods.

Section 7. "Industrial wastes" shall mean the wastewater from industrial processes, trade, or business as distinct from domestic or sanitary wastes.

Section 8. "Natural outlet" shall mean any outlet, including storm sewers and combined sewer overflows, into a watercourse, pond, ditch, lake, or other body of surface or groundwater.

Section 9. "May" is permissive (see "shall," Sec. 18).

Section 10. "Person" shall mean any individual, firm, company, association, society, corporation, group or a city, town, or other governmental unit.

Section 11. "pH" shall mean the logarithm of the reciprocal of the hydrogen-ion concentration. The concentration is the weight of hydrogen ions, in grams, per liter of solution. Neutral water, for example, has a pH value of 7 and a hydrogen-ion concentration of 10^{-7} .

Section 12. "Properly shredded garbage" shall mean the wastes from the preparation, cooking, and dispensing of food that have been shredded to such a degree that all particles will be carried freely under the flow conditions normally prevailing in public sewers, with no particle greater than 1/2 inch (1.27 centimeters) in any dimension.

Section 13. "Public sewer" shall mean a common sewer controlled by a governmental agency or public utility.

Section 14. "Sanitary sewer" shall mean a sewer that carries liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions together with minor quantities of ground, storm, and surface waters that are not admitted intentionally.

Section 15. "Sewage" is the spent water of a community. The preferred term is "wastewater," Section 24.

Section 16. "Sewer" shall mean a pipe or conduit that carries wastewater or drainage water.

Section 17. "Shall" is mandatory (see "may," Section 10).

Section 18. "Slug" shall mean any discharge of water or wastewater which in concentration of any given constituent or in quantity of flow exceeds for any period of duration longer than fifteen (15) minutes more than five (5) times the average twenty-four (24) hour concentration or flows during normal operation and shall adversely affect the collection system and/or performance of the wastewater treatment works.

Section 19. "Storm drain" (sometimes termed "storm sewer") shall mean a drain or sewer for conveying water, groundwater, subsurface water, or unpolluted water from any source.

Section 20. "Superintendent" shall mean the (superintendent of wastewater facilities, and/or of wastewater treatment works, and/or of water pollution control of the (city or town) of (), or his authorized deputy, agent, or representative.

Section 21. "Suspended solids" shall mean total suspended matter that either floats on the surface of, or is in suspension in, water, wastewater, or other liquids, and that is removable by laboratory filtering as prescribed in "Standard Methods for the Examination of Water and Wastewater" and referred to as nonfilterable residue.

Section 22. "Unpolluted water" is water of quality equal to or better than the effluent criteria in effect or water that would not cause violation of receiving water quality standards and would not be benefited by discharge to the sanitary sewers and wastewater treatment facilities provided.

Section 23. "Wastewater" shall mean the spent water of a community. From the standpoint of source, it may be a combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and stormwater that may be present.

Section 24. "Wastewater facilities" shall mean the structures, equipment, and processes required to collect, carry away, and treat domestic and industrial wastes and dispose of the effluent.

Section 25. "Wastewater treatment works" shall mean an arrangement of devices and structures for treating wastewater, industrial wastes, and sludge. Sometimes used as synonymous with "waste treatment plant" or "wastewater treatment plant" or "water pollution control plant."

Section 26. "Watercourse" shall mean a natural or artificial channel for the passage of water either continuously or intermittently.

ARTICLE II

Building Sewers and Connections

Section 1. No unauthorized person shall uncover, make any connections with or opening into, use, alter, or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the (superintendent). "Any person proposing

a new discharge into the system or a substantial change in the volume or character of pollutants that are being discharged into the system shall notify the (superintendent) at least () days prior to the the proposed change or connection."

Section 2. There shall be two (2) classes of building sewer permits: (a) for residential and commercial service, and (b) for service to establishments producing industrial wastes. In either case, the owner or his agent shall make application on a special form furnished by the (city or town). The permit application shall be supplemented by any plans, specifications, or other information considered pertinent in the judgement of the (superintendent). A permit and inspection fee of () dollars for a residential or commercial building sewer permit and () dollars for an industrial building sewer permit shall be paid to the (city or town) at the time the application is filed.

Section 3. All costs and expenses incident to the installation and connections of the building sewer shall be borne by the owner. The owner shall indemnify the (city or town) from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer.

Section 4. A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, the front building sewer may be extended to the rear building and the whole considered as one building sewer, but the (city or town) does not and will not assume any obligation or responsibility for damage caused by or resulting from any such single connection aforementioned.

Section 5. Old building sewers may be used in connection with new buildings only when they are found, on examination and test by the (superintendent), to meet all requirements of this ordinance.

Section 6. The size, slope, alignment and materials of construction of a building sewer or the connection of a building sewer into a public sewer and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling the trench, shall all conform to the requirements set out in the local city or town drain layer's manual.

Section 7. Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary wastewater carried by such building drain shall be lifted by an approved means and discharged to the building sewer.

Section 8. No person shall make connection of roof downspouts, exterior foundation drains, areaway drains, or other sources of surface runoff or ground water to a building sewer or building drain which in turn is connected directly or indirectly to a public sanitary sewer.

Section 9. The applicant for the building sewer permit shall notify the (superintendent) when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the (superintendent) or his representative.

Section 10. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the (city or town).

Section 11. All work related to the installation of sewers and sewer connections shall be performed by drain layers licensed by the (city or town) or persons acting under the direct supervision of a drain layer licensed by the (city or town) and only when such licensed person shall assume the responsibility for such work in accordance with these Rules and Regulations.

ARTICLE III

Use of the Public Sewers

Section 1. No person shall discharge or cause to be discharged any stormwater, surface water, groundwater, roof runoff, subsurface drainage, uncontaminated cooling water, or unpolluted industrial process waters to any sanitary sewer.

Section 2. Stormwater and all other unpolluted drainage shall be discharged to such sewers as are specifically designated as combined sewers or storm sewers, or to a natural outlet approved by the (superintendent). Unpolluted industrial cooling water or process waters may be discharged, on approval of the (superintendent), to a storm sewer, combined sewer, or natural outlet.

Section 3. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewers:

- a. Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas.

- b. Any waters or wastes containing toxic or poisonous solids, liquids, or gases in sufficient quantity, either singly or by intereaction with other wastes, to injure or interfere with any wastewater treatment process, constitute a hazard to humans or animals, create a public nuisance, or create any hazard in the receiving waters of the wastewater treatment works.
- c. Any waters or wastes having a pH lower than (5.5), or having any other corrosive property capable of causing damage or hazard to structures, equipment, and personnel of the wastewater facilities and treatment works.
- d. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the wastewater facilities, such as, but not limited to, ash, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails and paper dishes, cups, milk containers, etc.

Section 4. The following described substances, materials, waters, or waste shall be limited in discharges to municipal systems to concentrations or quantities which will not harm either the sewers, wastewater treatment process or equipment, will not have an adverse effect on the receiving stream, or will not otherwise endanger lives, limb, public property, or constitute a nuisance. The (superintendent) may set limitations lower than the limitations established in the regulations below if in his opinion such more severe limitations are necessary to meet the above objectives. In forming his opinion as to the acceptability, the (superintendent) will give consideration to such factors as the quantity of subject waste in relation to flows and velocities in the sewers, materials of construction of the sewers, the wastewater treatment process employed, capacity of the wastewater treatment plant, degree of treatability of the waste in the wastewater treatment plant, and other pertinent factors. The limitations or restrictions on materials or characteristics of waste or wastewaters discharged to the sanitary sewer which shall not be violated without approval of the (superintendent) are as follows:

- a. Wastewater having a temperature higher than 150 deg. Fahrenheit (65 deg. Celsius).
- b. Any water or waste containing fats, wax, grease, or oils, whether emulsified or not, in excess of one hundred (100) mg/L or containing substances which may

solidify or become viscous at temperatures between thirty-two (32) and one hundred fifty (150) deg. F. (0 and 65 deg. C.).

- c. Any garbage that has not been properly shredded (see Article I, Section 13.) Garbage grinders may be connected to sanitary sewers from homes, hotels, institutions, restaurants, hospitals, catering establishments, or similar places where garbage originates from the preparation of food in kitchens for the purpose of consumption on the premises or when served by caterers.
- d. Any waters of wastes containing strong acid iron pickling wastes, or concentrated plating solutions whether neutralized or not.
- e. Any waters or wastes containing a toxic pollutant in toxic amounts as defined in standards or guidelines issued pursuant to Section 307 (a) of Public Law 92-500 and as established by the superintendent.
- f. Any waters or wastes exerting an excessive chlorine requirement, to such degree that any such material received in the composite sewage at the wastewater treatment works exceeds the limits established by the (superintendent) for such materials.
- g. Any waters or wastes containing odor-producing substances exceeding limits which may be established by the (superintendent).
- h. Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the (superintendent) in compliance with applicable state or federal regulations.
- i. Any waters or wastes having a pH in excess of 9.5.
- j. Materials which exert or cause:
 - 1. Unusual concentrations of inert suspended solids (such as, but not limited to, Fullers earth, lime slurries, and lime residues) or of dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate).
 - 2. Excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions).

3. Unusual BOD, chemical oxygen demand, or chlorine requirements in such quantities as to constitute a significant load on the wastewater treatment works.
4. Unusual volume of flow or concentration of wastes constituting "slugs" as defined herein.
- k. Waters or wastes containing substances which are not amenable to treatment or reduction by the wastewater treatment process employed, or are amenable to treatment only to such degree that the wastewater treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters.
- l. Any water or wastes which, by interaction with other water or wastes in the public sewer system, release obnoxious gases, form suspended solids which interfere with the collection system, or create a condition deleterious to structures and treatment processes.
- m. Any septic tank or cesspool pumpings unless permission for their discharge is obtained from the (superintendent).

Section 5. If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which waters contain the substances or possess the characteristics enumerated in Section 4 of this Article, and which in the judgement of the (superintendent), may have a deleterious effect upon the wastewater treatment works, processes, equipment, or receiving waters, or violate State or Federal Regulations, or which otherwise create a hazard to life or constitute a public nuisance, the (superintendent) may:

- a. Reject the wastes,
- b. Require pretreatment to an acceptable condition for discharge to the public sewers,
- c. Require control over the quantities and rates of discharge, and/or
- d. Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges under the provisions of Section 11 of this article.

If the (superintendent) permits the pretreatment or equalization of waste flows, the design and installation of the

plants and equipment shall be subject to the review and approval of the (superintendent), and subject to the requirements of all applicable Federal Guidelines, as promulgated by the U. S. Environmental Protection Agency.

Section 6. Grease, oil, and sand interceptors shall be provided when, in the opinion of the (superintendent), they are necessary for the proper handling of liquid wastes containing floatable grease in excessive amounts, as specified in Section 4(c), or any flammable wastes, sand, or other harmful ingredients; except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the (superintendent), and shall be located as to be readily and easily accessible for cleaning and inspection. In the maintaining of these interceptors the owner(s) shall be responsible for the proper removal and disposal by appropriate means of the captured material and shall maintain records of the dates, and means of disposal which are subject to review by the (superintendent). Any removal and hauling of the collected materials not performed by owner(s)' personnel must be performed by currently licensed waste disposal firms.

Section 7. Where pretreatment or flow-equalizing facilities are provided or required for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation by the owner(s) at his expense.

Section 8. When required by the (superintendent), the owner of any property serviced by a building sewer carrying industrial wastes shall install a suitable structure together with such necessary meters and other appurtenances in the building sewer to facilitate observation, sampling, and measurement of the wastes. Such structure, when required, shall be accessibly and safely located and shall be constructed in accordance with plans approved by the (superintendent). The structure shall be installed by the owner at his expense and shall be maintained by him so as to be safe and accessible at all times.

Section 9. The (superintendent) may require a user of sewer services to provide information needed to determine compliance with this ordinance. These requirements may include:

1. Wastewaters discharge peak rate and volume over a specified time period.
2. Chemical analyses of wastewaters.
3. Information on raw materials, processes, and products affecting wastewater volume and quality.
4. Quantity and disposition of specific liquid, sludge, oil, solvent, or other materials important to sewer use control.

5. A plot plan of sewers of the user's property showing sewer and pretreatment facility location.
6. Details of wastewater pretreatment facilities.
7. Details of systems to prevent and control the losses of materials through spills to the municipal sewer.

Section 10. All measurements, tests, and analyses of the characteristics of waters and wastes to which reference is made in this ordinance shall be determined in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater," published by the American Public Health Association. Sampling methods, location, times, durations, and frequencies are to be determined on an individual basis subject to approval by the (superintendent).

Section 11. If, for any reason, a facility does not comply with or will be unable to comply with any prohibition or limitations in this ordinance, the facility responsible for such discharge shall immediately notify the superintendent so that corrective action may be taken to protect the wastewater facilities. In addition, a written report addressed to the superintendent detailing the date, time, and cause of the accidental discharge, the quantity and characteristics of the discharge, and corrective action taken to prevent future discharges shall be filed by the responsible industrial facility within five (5) days of the occurrence of the noncomplying discharge.

Section 12. No statement contained in this article shall be construed as preventing any special agreement or arrangement between the (city or town) and any industrial concern whereby an industrial waste of unusual strength or character may be accepted by the (city or town) for treatment.

ARTICLE IV

Protection from Damage

Section 1. No person(s) shall maliciously, willfully, or negligently break, damage, destroy, uncover, deface, or tamper with any structure, appurtenance or equipment which is a part of the wastewater facilities. Any person(s) violating this provision shall be subject to immediate arrest under charge of disorderly conduct.

ARTICLE V

Powers and Authority of Inspectors
(See Section 3.10)

Section 1. The (superintendent) and other duly authorized employees of the (city or town) bearing proper credentials and identification shall be permitted to enter all properties for the purposes of inspection, observation, measurement, sampling, and testing in accordance with the provisions of this ordinance. The (superintendent) or his representative shall have no authority to inquire into any processes including metallurgical, chemical, oil, refining, ceramic, paper, or other industries beyond that point having a direct bearing on the kind and source of discharge to the sewers or waterways or facilities for wastes treatment.

Section 2. While performing the necessary work on private properties referred to in Article V, Section 1 above, the (superintendent) or duly authorized employees of the (city or town) shall observe all safety rules applicable to the premises established by the company and the company shall be held harmless for injury or death to the (city or town) employees and the (city or town) shall indemnify the company against loss or damage to its property by (city or town) employees and against liability claims and demand for personal injury or property damage asserted against the company and growing out of the gauging and sampling operation, except as such may be caused by negligence or failure of the company to maintain safe conditions as required in Article III, Section 8.

Section 3. The (superintendent) and other duly authorized employees of the (city or town) bearing proper credentials and identification shall be permitted to enter all private properties through which the (city or town) holds a duly negotiated easement for the purposes of, but not limited to, inspection, observation, measurement, sampling, repair, and maintenance of any portion of the wastewater facilities lying within said easement. All entry and subsequent work, if any, on said easement, shall be done in full accordance with the terms of the duly negotiated easement pertaining to the private property involved.

ARTICLE VI

Penalties

Section 1. Any person found to be violating any provision of this ordinance except Article IV shall be served by the (city or town) with written notice stating the nature of the violation and providing a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such notice, permanently cease all violations.

Section 2. Any person who shall continue any violation beyond the time limit provided for in Article VI, Section 1, shall be guilty of a misdemeanor, and on conviction thereof shall be fined in the amount not exceeding () dollars for each violation. Each day in which any such violation continue shall be deemed a separate offense.

Section 3. Any person violating any of the provisions of this ordinance shall become liable to the (city or town) for any expense, loss, or damage occasioned the (city or town) by reason of such violation.

ARTICLE VII

Validity

Section 1. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

Section 2. The invalidity of any section, clause, sentence, or provision of this ordinance shall not effect the validity of any other part of this ordinance which can be given effect without such invalid part or parts.

ARTICLE VIII

Ordinance in Force

Section 1. This ordinance shall be in full force and effect from and after its passage, approval, recording, and publication as provided by law.

Section 2. Passed and adopted by the () of the (city or town) of _____, State of _____ on the _____ day of (month), (Year), by the following vote:

Ayes _____: namely _____

Nays _____: namely _____

Approved this _____ day of _____

(Signed) _____

Attest: _____

Signed _____, (Clerk)

Section 3. To notify the (superintendent) when the building sewer is ready for inspection and connection to the public sewer, but before any portion of the work is covered.

Date: _____ Signed _____
(Applicant)

(Address of Applicant)

\$ _____ inspection fee paid.

(Certification by (city or town) treasurer)

Application approved and permit issued:

Date: _____

Signed _____
Superintendent

SAMPLE DRAIN LAYER'S MANUAL

PART I

STANDARD PRACTICES AND PROCEDURES

Section 1 - PERMITS

a. Before the (city or town) will issue any permit for sewer work within the street lines of any public street (which generally includes the gutter and sidewalk area) or as otherwise required, the licensed Drain Layer shall present the required Permit for street excavation from the proper city or town authority.

b. When the proposed sewer work is within the limits of any State Highway, the Drain Layer shall also present the required permit for excavation from the Mass. State Dept. of Public Works before receiving the required sewer permit from the (city or town).

c. The Drain Layer should facilitate the issuance of the permit by providing the (city or town) with the house number, the lot number or the frontage of the lot and its location with respect to the nearest side street, the owner's (not builder's) name and address, the type of occupancy of the premises, and the number of family units to be served by the connection.

d. In the case of a proposed sewer connection from an industrial building, commercial building, apartment house or any building other than a normal residential building, the (city or town) should be provided with the proposed method of connections of sanitary sewage to the public sewer. Such plan should be submitted to the (city or town) prior to the time when the permit is needed in order to allow the (city or town) sufficient time to properly investigate the proposed design of connection and make any recommendations the (city or town) may deem advisable.

e. Where the sewer may possibly be subjected to prohibited wastes, such as oil, grease, gasoline, sand, grit, etc., as shall be determined by the (city or town), the plan should show the installation of an approved oil or grease separator and/or sand trap on the sanitary plumbing. Plans and specifications must be submitted and approved for oil or grease separators, sand traps or other pretreatment facilities and on all sewage ejectors or sump pumps.

Section 2 - SAFETY

- a. Keep all phases of the work SAFE.
- b. Use adequate bracing and sheeting in trench excavations which are deep or in soils which are unstable or likely to flow or cave in. Safeguard all excavations with properly placed barricades and proper lighting at dark.

Section 3 - INSURANCE

- a. The insurance requirements of the (city or town) for licensed Drain Layers are minimum requirements. The Drain Layer should, for his own protection, review his insurance to see that he has the proper coverage for the character of work he may be doing.

Section 4 - CONNECTION OF BUILDING PLUMBING

- a. The building plumbing pipe shall not be connected to the sewer house connection unless the building plumbing is complete or unless the length of building plumbing pipe under or through the foundations is tightly capped with a temporary lead caulked cap (i.e., cast-iron soil pipe "plug for hub"), or until the (city or town) is satisfied that the building plumbing, if not completed, is so constructed to prohibit the discharge of subsoil drainage, surface, or subsurface storm or muddy water from entering the sanitary sewer system.

Section 5 - INSPECTION

- a. When ready, the Drain Layer shall telephone the office of the (superintendent) to request an inspector on the site. The Drain Layer shall refrain from removing the cap or breaking into any existing pipe to make the connection or to commence laying pipe or building structures until the inspector arrives on the job and gives his approval.
- b. In the case of repairs, allow the (city or town) Inspector to observe and make report on the disrepair before removal of any pipe. Before making repairs, the Drain Layer and inspector should make sure that the remaining connection in both directions is in good condition and free from obstruction.
- c. After the cap is removed at the point of connection to the public sewer, the Drain Layer should make certain by probing, rodding, or by use of mirror and sunlight that the pipe from the capped end to the public sewer is in good condition and

free from obstruction. If the lateral is found to be obstructed or in bad condition, the Drain Layer should refrain from making any connection thereto until the (city or town) Inspector has advised further procedure.

d. After the (city or town) Inspector has approved the initial construction of the house connection pipe, under this Section, the Drain Layer may complete the house connection pipe construction, but shall not backfill the area of trench around the joint with the building plumbing pipe and shall leave the pipe uncovered until such time as this joint has been finally inspected and approved by the (city or town). Arrangements should be made, on site, between the (city or town) Inspector and the Drain Layer for the final inspection. If the connection is not approved, the Drain Layer shall make the necessary corrections and request further inspection. The (city or town) Inspector will post notice to the Drain Layer, send a notice to the Town Building Inspector and notice to the owner that the connection is approved.

e. Sewer connections serving buildings to be demolished shall be properly bulkheaded at the street line or other point as approved by the (city or town). This bulkheading should be done by a licensed Drain Layer under (city or town) permit prior to demolition of the building to insure a safer condition for our inspector and in order to more adequately determine the location of the drains to be sealed.

PART II

STANDARD REQUIREMENTS AND SPECIFICATIONS

Section 1 - GENERAL

a. The requirements herein established regulate the sizes, materials, methods, and workmanship to be used in the construction of sewers, drains, house connections, and other similar work and appurtenances thereto connected or intended to be connected or to discharge, directly or indirectly, to any public sewer or drain.

b. These requirements are minimum requirements primarily for the construction of sewer house connections but shall also apply to the construction of any sewer or portion of sewer not otherwise governed by any other regulation, requirement, or specification of the (city or town).

Section 2 - PIPE SIZE

a. Pipe used for the construction of house connections, laterals and drains not otherwise specifically governed or specified by the (city or town) shall be not less than 6 inches in diameter (5 inch minimum if cast iron).

b. In general, when using pipe other than cast iron soil pipe, the house connection pipe shall have sufficient inside diameter or acceptable dimensions in the bell or other fitting so as to allow an approved "O" ring gasket connection to the house plumbing pipe at the normal point just outside the building to be connected. The (city or town) may limit the size and rate of grade of pipe, or limit the discharge in some other manner, if the proposed amount of said discharge from the individual house connection may cause overloading of any part of the public sewer system.

Section 3 - CONSTRUCTION-GENERAL

a. When laying pipe, the Drain Layer shall always follow good practice, including hand shovel shaping of bottom of trench, digging bell holes, laying pipe, making joints, careful hand filling and hand tamping of granular soil around and over the pipe to firmly bed it in place and hold and protect it against disturbance from the backfilling process.

b. In the construction of sewer house connections, the pipe shall be laid on an even-tamped foundation of coarse sand, fine gravel or 3/4-inch crushed stone except that when wet or soft soil conditions prevail, 3/4-inch crushed stone shall be used for foundation of all pipe. The backfill shall be thoroughly

compacted by tamping or other approved methods up to the spring line of the pipe (see also Section 5, Part 2, Backfill Operations).

c. Pipe laid on rock or in a rock trench shall be constructed as required by the (superintendent).

d. All manholes, catchbasins or other structures shall be constructed to meet the required minimum standards of the (city or town).

Section 4 - LAYING PIPE IN LATERALS AND HOUSE CONNECTIONS

a. Pipe shall be laid to a reasonable straight line and preferably at not less than 2 percent grade (1/4 inch per foot) except that where this is impractical or where a hardship would be created by such a grade the pipe may be laid to a grade of not less than 1 percent (1/8 inch per foot).

b. Pipes larger than 6 inches diameter or pipes conveying stormwater only, may be laid at a grade less than 1 percent if specifically approved by the (superintendent).

c. The (city or town) Inspector will generally check the Drain Layer on the approximate rise and rate of grade as proposed and will approve where there will be sufficient rise in the pipe to provide at least 1 percent grade. If, as proposed, 1 percent grade cannot be expected, then the Drain Layer should advise the owner that the building be raised or to expect that the sewer connection will be higher in the building than anticipated.

d. Wherever possible, 8 feet of cover should be provided within the street lines. This depth of cover is usually required to avoid interference with other existing and future utilities in the street such as water, gas, duct lines, and storm sewers which generally have less cover.

e. If house connection depth is not sufficient to clear under other utilities, varying gravity flow grades shall be designed (not less than 1 percent) to pass over or under without touching said other utilities. If, on excavating for the sewer or sewer connections, the natural soil foundation is found to be soft, the soft soil shall be removed and not less than 4 inches of approved stone, processed stone or concrete, as required by the (superintendent), shall be placed in an approved manner for the pipe foundation.

f. In general, the Drain Layer shall maintain adequate cover to protect the pipe being installed from physical damage due to

live loads or possible winter freezing. In an area where pavement and cultivated lawn already exist, such cover shall generally be no less than three feet (3 ft); in an area not so developed or in an area where existing ground surfaces will be altered, such cover shall generally be no less than four feet (4 ft) and if reinforced concrete or cast iron pipe is used, the cover may be reduced one foot in each case.

g. Whenever the Drain Layer temporarily terminates the sewer connection outside the building, the open end of the pipe shall be fitted with an approved cap to prevent any drainage, storm or muddy water and debris from entering the public sewer.

Section 5 - BACKFILL OPERATIONS

a. Care shall be taken during backfilling that the pipe is not injured or disturbed by stones or other material. Backfill material to a foot above the pipe shall be of a suitably granular nature with no large stones on or near the pipe.

b. The backfill shall be thoroughly compacted by tamping or other approved methods up to the spring line of the pipe.

c. The type of backfill above a level one foot above the pipe shall meet the requirements of the (city or town) and such requirement can be determined from the proper town official at the time of obtaining the street excavation permit.

d. To make sure that surface water and groundwater is prevented from seeping or flowing back under or into the cellar, the Drain Layer and the plumber should seal the opening under the footing with concrete firmly packed between the cast iron soil pipe and the concrete footing and earth around the opening to prevent the backflow of seepage of subsoil or surface water into the building.

Section 6 - PIPE KIND

Pipe used for the construction of work within the scope of these regulations shall be:

a. Approved vitrified clay sewer pipe to ASTM Standards with joint materials having resilient properties conforming to ASTM Specification C425 - the latest revision thereof. Each length of pipe shall be clearly stamped with the name of the manufacturer and the location of the plant, and extra-strength pipe shall additionally be stamped with an "ES", all as required in the ASTM Specifications; or

b. Approved asbestos cement pipe conforming to ASTM Specifications C428 and C644 - the latest revision thereof. Asbestos cement pipe shall be of the simplex coupling or bell and spigot joint type with compressed rubber ring gaskets and all pipe must be clearly stamped with the class and name of manufacturer; or

c. Approved plastic pipe conforming to ASTM Specification D3034 - the latest revision thereof. Plastic pipe shall have joints of the bell and spigot type with compressed rubber ring gaskets and shall be clearly stamped with the manufacturer's name; or

d. Extra-heavy cast iron soil pipe conforming to requirements of the local Building and Plumbing Code and to the latest ASTM Specification A74 and to the latest American Standard for Cast Iron Soil Pipe and Fittings Specifications ASA-No. A40.1; or

e. Reinforced concrete pipe of required class, ASTM C-76, with approved "O" ring type gasket. Generally reinforced concrete pipe shall not be used in sizes less than 12 inches in diameter.

f. Where excessive depths create loading beyond the loading capacity of the pipe described above, then the Drain Layer shall use extra-strength pipe or concrete encasement as may be approved by the superintendent.

g. Where pipe is being constructed to depths that provide less than the minimum cover, as outlined in PART II, Section 4, paragraph f, the Drain Layer shall use cast iron water pipe, A.S.A. A21.8, Class 22, extra-heavy cast iron soil pipe or concrete encasement, depending upon available cover and as may be approved by the (superintendent).

h. In Industrially Zoned areas and where the potential of industrial or injurious wastes exists, only approved plastic, tile or other pipe approved for such use shall be installed.

Section 7 - PIPE JOINTS

a. The use of cement joints is prohibited.

b. At a transition point between two different types of pipe in the same house connection, the joint shall be made in an approved manner, using approved joint sealers, adapters or other approved means.

Section 8 - JOINT BETWEEN HOUSE CONNECTION AND HOUSE PLUMBING

- a. The house plumbing (generally 4 inch cast iron) generally extends a few feet outside the foundation wall, at which point it is connected to the sewer house connection from the public sewer.
- b. The joint between the sewer house connection and the plumbing pipe from the building shall be made watertight by the Drain Layer with an approved rubber or plastisol ring, fitting or adapter and inspected by the (city or town).

Section 9 - IMPROPER DISCHARGE TO SEWERS

- a. Until proper fixtures have been completed and tightly joined to a sewer house connection, no one shall allow, pump or discharge any water, wastes or other drainage to the sewer house connection or public sewer.
- b. Any water in a trench or excavation should be pumped or discharged to a brook, gutter, catchbasin or other proper drainage facility.
- c. Where the public sewer to which any connection is being made or proposed is a SANITARY SEWER, the Drain Layer shall avoid construction which would allow anything other than SANITARY SEWAGE to enter the sewer. The permit issued by the (city or town) for a particular connection will indicate the kind of sewer and what drainage or wastes are permitted or not permitted.
- d. Clean water drainage to a public sanitary sewer is prohibited by the (city or town) sewer ordinance. Where there is a public sanitary sewer, all subsoil drainage, stormwater, roof water, surface and subsurface drainage, and cooling water shall be properly separated from the sanitary sewer house connection and disposed of otherwise to the storm drain or natural watercourse.

Section 10 - GROUNDWATER SEEPAGE AND INFILTRATION

- a. Prevention of infiltration of subsurface and subsoil waters to the sanitary sewer system is always of great concern to a (city or town). Many of the requirements of the (city or town) for pipe laying and jointing are intended to cause the construction of sewers that are reasonably watertight so as to minimize infiltration of water through joints or defects into the sewer.

b. The (city or town) may, when it deems advisable, require a leakage test of the pipe and structures after the construction of any house connection regulated herein. If a leak is found, the Drain Layer shall repair, correct the construction and stop the leakage to the satisfaction of the (superintendent).

Section 11 - SEWER HOUSE CONNECTIONS IN PROXIMITY TO WATER SERVICE, STORM DRAIN OR OTHER UTILITY

a. The sanitary sewer connection or storm drain connection and water service should be laid in separate trenches about 5 feet apart. If a building sewer (either storm or sanitary) is installed in the same trench with the water service, the sewer pipe shall be cast iron with bell and spigot joints, either extra-heavy tarred soil pipe, asbestos cement or cast iron pressure pipe. All piping shall be coated and so installed as to remain watertight and rootproof.

b. The sanitary sewer and storm drain connection shall be constructed not less than 5 feet from any underground gas, electric or telephone service or as may be approved by the appropriate Public Utility Company.

SIC CODE DESCRIPTION

Major Group 20.—FOOD AND KINDRED PRODUCTS

- 201 MEAT PRODUCTS
 - 2011 Meat Packaging Plants
 - 2013 Sausages and Other Prepared Meat Products
 - 2016 Poultry Dressing Plants
 - 2017 Poultry and Egg Processing
- 202 DAIRY PRODUCTS
 - 2021 Creamery Butter
 - 2022 Cheese Natural and Processed
 - 2023 Condensed and Evaporated Milk
 - 2024 Ice Cream and Frozen Deserts
 - 2026 Fluid Milk
- 203 CANNED AND PRESERVED FRUITS AND VEGETABLES
 - 2032 Canned Specialties
 - 2033 Canned Fruits, Vegetables, Preserves, Jams and Jellies
 - 2034 Dried and Dehydrated Fruits, Vegetables and Soup Mixes
 - 2035 Pickled Fruits and Vegetables, Vegetable Sauces and Seasonings, and Salad Dressings
 - 2037 Frozen Fruits, Fruit Juices and Vegetables
 - 2038 Frozen Specialties
- 204 GRAIN MILL PRODUCTS
 - 2041 Flour and Other Grain Mill Products
 - 2043 Cereal Breakfast Foods
 - 2044 Rice Milling
 - 2045 Blended and Prepared Flour
 - 2046 Wet Corn Milling
 - 2047 Dog, Cat and Other Pet Food
 - 2048 Prepared Feeds and Feed Ingredients for Animals and Fowls, Not Elsewhere Classified
- 205 BAKERY PRODUCTS
 - 2051 Bread and Other Bakery Products, Except Cookies and Crackers
 - 2052 Cookies and Crackers
- 206 SUGAR AND CONFECTIONERY PRODUCTS
 - 2061 Cane Sugar, Except Refining Only
 - 2062 Cane Sugar Refining
 - 2063 Beet Sugar
 - 2065 Candy and Other Confectionery Products
 - 2066 Chocolate and Cocoa Products
 - 2067 Chewing Gum
- 207 FATS AND OILS
 - 2074 Cottonseed Oil Mills
 - 2075 Soybean Oil Mills
 - 2076 Vegetable Oil Mills, Except Corn, Cottonseed and Soybean
 - 2077 Animal and Marine Fats and Oils
 - 2079 Shortening, Table Oils, Margarine and Other Edible Fats and Oils, Not Elsewhere Classified
- 208 BEVERAGES
 - 2082 Malt Beverages
 - 2083 Malt
 - 2084 Wines, Brandy, and Brandy Spirits
 - 2085 Distilled, Rectified, and Blended Liquors
 - 2086 Bottled and Canned Soft Drinks and Carbonated Waters

209

- 2087 Flavoring Extracts and Flavoring Sirups, Not Elsewhere Classified
- MISCELLANEOUS FOOD PREPARATIONS AND KINDRED PRODUCTS
- 2091 Canned and Cured Fish and Seafoods
- 2092 Fresh or Frozen Packaged Fish and Seafoods
- 2095 Roasted Coffee
- 2097 Manufactured Ice
- 2098 Macaroni, Spaghetti, Vermicelli and Noodles
- 2099 Food Preparations, Not Elsewhere Classified

Major Group 21.—TOBACCO MANUFACTURES

- 211 CIGARETTES
 - 2111 Cigarettes
- 212 CIGARS
 - 2121 Cigars
- 213 TOBACCO (CHEWING AND SMOKING) AND SNUFF
 - 2131 Tobacco (Chewing and Smoking) and Snuff
- 214 TOBACCO STEMMING AND REDRYING
 - 2141 Tobacco Stemming and Redrying

Major Group 22.—TEXTILE MILL PRODUCTS

- 221 BROAD WOVEN FABRIC MILLS, COTTON
 - 2211 Broad Woven Fabric Mills, Cotton
 - 2221 Broad Woven Fabric Mills, Man-Made Fiber and Silk
 - 2231 Broad Woven Fabric Mills, Wool (Including Dyeing and Finishing)
- 224 NARROW FABRICS AND OTHER SMALLWARES MILLS, COTTON, WOOL, SILK, AND MAN-MADE FIBER
 - 2241 Narrow Fabrics and Other Smallwares Mills: Cotton, Wool, Silk, and Man-Made Fiber
- 225 KNITTING MILLS
 - 2251 Women's Full Length and Knee Length Hosiery
 - 2252 Hosiery, Except Women's Full Length and Knee High Hosiery
 - 2253 Knit Outerwear Mills
 - 2254 Knit Underwear Mills
 - 2257 Circular Knit Fabric Mills
 - 2258 Warp Knit Fabric Mills
 - 2259 Knitting Mills, Not Elsewhere Classified
- 226 DYEING AND FINISHING TEXTILES EXCEPT WOOL FABRICS AND KNIT GOODS
 - 2261 Finishers of Broad Woven Fabrics of Cotton
 - 2262 Finishers of Broad Woven Fabrics of Man-Made Fiber and Silk
 - 2269 Finishers of Textiles, Not Elsewhere Classified
- 227 FLOOR COVERING MILLS
 - 2271 Woven Carpets and Rugs
 - 2272 Tufted Carpets and Rugs

- 2279 Carpets and Rugs, Not Elsewhere Classified
- 228 YARN AND THREAD MILLS
- 2281 Yarn Spinning Mills: Cotton, Man-Made Fibers and Silk
- 2282 Yarn Texturizing, Throwing, Twisting, and Winding Mills: Cotton, Man-Made Fibers and Silk
- 2283 Yarn Mills, Wool, Including Carpet and Rug Yarn
- 2284 Thread Mills
- 229 MISCELLANEOUS TEXTILE GOODS
- 2291 Felt Goods, Except Woven Felts and Hats
- 2292 Lace Goods
- 2293 Paddings and Upholstery Filling
- 2294 Processed Waste and Recovered Fibers and Flock
- 2295 Coated Fabrics, Not Rubberized
- 2296 Tire Cord and Fabric
- 2297 Nonwoven Fabrics
- 2298 Cordage and Twine
- 2299 Textile Goods, Not Elsewhere Classified

Major Group 23.—APPAREL AND OTHER FINISHED PRODUCTS MADE FROM FABRICS AND SIMILAR MATERIALS

- 231 MEN'S, YOUTHS', AND BOYS' SUITS, COATS, AND OVERCOATS
- 2311 Men's, Youths', and Boys' Shirts (Except Work Shirts) and Nightwear
- 232 MEN'S, YOUTHS', AND BOYS' FURNISHINGS, WORK CLOTHING, AND ALLIED GARMENTS
- 2321 Men's, Youths', and Boys' Shirts (Except Work Shirts) and Nightwear
- 2322 Men's, Youths', and Boys' Underwear
- 2323 Men's, Youths', and Boys' Neckwear
- 2327 Men's, Youths', and Boys' Separate Trousers
- 2328 Men's, Youths', and Boys' Work Clothing
- 2329 Men's, Youths', and Boys' Clothing, Not Elsewhere Classified
- 233 WOMEN'S, MISSES' AND JUNIORS' OUTERWEAR
- 2331 Women's, Misses', and Juniors' Blouses, Waists and Shirts
- 2335 Women's, Misses', and Juniors' Dresses
- 2337 Women's, Misses', and Juniors' Suits, Skirts and Coats
- 2339 Women's, Misses', and Juniors' Outerwear, Not Elsewhere Classified
- 234 WOMEN'S, MISSES', CHILDREN'S, AND INFANTS' UNDERGARMENTS
- 2341 Women's, Misses', Children's, and Infants' Underwear and Nightwear
- 2342 Brassieres, Girdles, and Allied Garments
- 235 HATS, CAPS, AND MILLINERY
- 2351 Millinery
- 2352 Hats and Caps, Except Millinery
- 236 GIRLS', CHILDREN'S, AND INFANTS' OUTERWEAR
- 2361 Girls', Children's, and Infants' Dresses, Blouses, Waists, and Shirts
- 2363 Girls', Children's, and Infants' Coats and Suits

237

238

239

- 2369 Girls', Children's, and Infants' Outerwear, Not Elsewhere Classified
- FUR GOODS
- 2371 Fur Goods
- MISCELLANEOUS APPAREL AND ACCESSORIES
- 2381 Dress and Work Gloves, Except Knit and All-Leather
- 2384 Robes and Dressing Gowns
- 2385 Raincoats and Other Waterproof Outer Garments
- 2386 Leather and Sheep Lined Clothing
- 2387 Apparel Belts
- 2389 Apparel and Accessories, Not Elsewhere Classified
- MISCELLANEOUS FABRICATED TEXTILE PRODUCTS
- 2391 Curtains and Draperies
- 2392 Housefurnishings, Except Curtains and Draperies
- 2393 Textile Bags
- 2394 Canvas and Related Products
- 2395 Pleating, Decorative and Novelty Stitching, and Tucking for the Trade
- 2396 Automotive Trimmings, Apparel Findings, and Related Products
- 2397 Schiffli Machine Embroideries
- 2399 Fabricated Textile Products, Not Elsewhere Classified

Major Group 24.—LUMBER AND WOOD PRODUCTS, EXCEPT FURNITURE

241

242

243

244

245

249

- LOGGING CAMPS AND LOGGING CONTRACTORS
- 2411 Logging Camps and Logging Contractors
- SAWMILLS AND PLANING MILLS
- 2421 Sawmills and Planing Mills, General
- 2426 Hardwood Dimension and Flooring Mills
- 2429 Special Product Sawmills, Not Elsewhere Classified
- MILLWORK, VENEER, PLYWOOD, AND STRUCTURAL WOOD MEMBERS
- 2431 Millwork
- 2434 Wood Kitchen Cabinets
- 2435 Hardwood Veneer and Plywood
- 2436 Softwood Veneer and Plywood
- 2439 Structural Wood Members, Not Elsewhere Classified
- WOOD CONTAINERS
- 2441 Nailed and Lock Corner Wood Boxes and Shook
- 2448 Wood Pallets and Skids
- 2449 Wood Containers, Not Elsewhere Classified
- WOOD BUILDINGS AND MOBILE HOMES
- 2451 Mobile Homes
- 2452 Prefabricated Wood Buildings and Components
- MISCELLANEOUS WOOD PRODUCTS
- 2491 Wood Preserving
- 2492 Particleboard
- 2499 Wood Products, Not Elsewhere Classified

Major Group 25.—FURNITURE AND FIXTURES

- 251 HOUSEHOLD FURNITURE
- 2511 Wood Household Furniture, Except Upholstered
- 2512 Wood Household Furniture, Upholstered
- 2514 Metal Household Furniture
- 2515 Mattresses and Bedsprings
- 2517 Wood Television, Radio, Phonograph, and Sewing Machine Cabinets
- 2519 Household Furniture, Not Elsewhere Classified
- 252 OFFICE FURNITURE
- 2521 Wood Office Furniture
- 2522 Metal Office Furniture
- 253 PUBLIC BUILDING AND RELATED FURNITURE
- 2531 Public Building and Related Furniture
- 254 PARTITIONS, SHELVING, LOCKERS, AND OFFICE AND STORE FIXTURES.
- 2541 Wood Partitions, Shelving, Lockers, and Office and Store Fixtures
- 2542 Metal Partitions, Shelving, Lockers, and Office and Store Fixtures
- 259 MISCELLANEOUS FURNITURE AND FIXTURES
- 2591 Drapery Hardware and Window Blinds and Shades
- 2599 Furniture and Fixtures, Not Elsewhere Classified

Major Group 26.—PAPER AND ALLIED PRODUCTS

- 261 PULP MILLS
- 2611 Pulp Mills
- 262 PAPER MILLS, EXCEPT BUILDING PAPER MILLS
- 2621 Paper Mills, Except Building Paper Mills
- 263 PAPERBOARD MILLS
- 2631 Paperboard Mills
- 264 CONVERTED PAPER AND PAPERBOARD PRODUCTS, EXCEPT CONTAINERS AND BOXES
- 2641 Paper Coating and Glazing
- 2642 Envelopes
- 2643 Bags, Except Textile Bags
- 2645 Die-Cut Paper and Paperboard and Cardboard
- 2646 Pressed and Molded Pulp Goods
- 2647 Sanitary Paper Products
- 2648 Stationery, Tablets and Related Products
- 2649 Converted Paper and Paperboard Products, Not Elsewhere Classified
- 265 PAPERBOARD CONTAINERS AND BOXES
- 2651 Folding Paperboard Boxes
- 2652 Set-Up Paperboard Boxes
- 2653 Corrugated and Solid Fiber Boxes
- 2654 Sanitary Food Containers
- 2655 Fiber Cans, Tubes, Drums, and Similar Products
- 266 BUILDING PAPER AND BUILDING BOARD MILLS
- 2661 Building Paper and Building Board Mills

Major Group 27.—PRINTING, PUBLISHING, AND ALLIED INDUSTRIES

- 271 NEWSPAPERS: PUBLISHING, PUBLISHING AND PRINTING
- 2711 Newspapers: Publishing, Publishing and Printing
- 272 PERIODICALS: PUBLISHING, PUBLISHING AND PRINTING
- 2721 Periodicals: Publishing, Publishing and Printing
- 273 BOOKS
- 2731 Books: Publishing, Publishing and Printing
- 2732 Book Printing
- 274 MISCELLANEOUS PUBLISHING
- 2741 Miscellaneous Publishing
- 275 COMMERCIAL PRINTING
- 2751 Commercial Printing, Letterpress and Screen
- 2752 Commercial Printing, Lithographic
- 2753 Engraving and Plate Printing
- 2754 Commercial Printing, Gravure
- 276 MANIFOLD BUSINESS FORMS
- 2761 Manifold Business Forms
- 277 GREETING CARD PUBLISHING
- 2771 Greeting Card Publishing
- 278 BLANKBOOKS, LOOSELEAF BINDERS, AND BOOKBINDING AND RELATED WORK
- 2782 Blankbooks, Looseleaf Binders and Devices
- 2789 Bookbinding and Related Work
- 279 SERVICE INDUSTRIES FOR THE PRINTING TRADE
- 2791 Typesetting
- 2793 Photoengraving
- 2794 Electrotyping and Stereotyping
- 2795 Lithographic Platemaking and Related Services

Major Group 28.—CHEMICALS AND ALLIED PRODUCTS

- 281 INDUSTRIAL INORGANIC CHEMICALS
- 2812 Alkalies and Chlorine
- 2813 Industrial Gases
- 2816 Inorganic Pigments
- 2819 Industrial Inorganic Chemicals, Not Elsewhere Classified
- 282 PLASTICS MATERIALS AND SYNTHETIC RESINS, SYNTHETIC RUBBER, SYNTHETIC AND OTHER MAN-MADE FIBERS, EXCEPT GLASS
- 2821 Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
- 2822 Synthetic Rubber (Vulcanizable Elastomers)
- 2823 Cellulosic Man-Made Fibers
- 2824 Synthetic Organic Fibers, Except Cellulosic
- 283 DRUGS
- 2831 Biological Products

	2833	Medicinal Chemicals and Botanical Products
	2831	Pharmaceutical Preparations
284		SOAP, DETERGENTS, AND CLEANING PREPARATIONS, PERFUMES, COSMETICS, AND OTHER TOILET PREPARATIONS
	2841	Soap and Other Detergents, Except Specialty Cleaners
	2842	Specialty Cleaning, Polishing, and Sanitation Preparations
	2843	Surface Active Agents, Finishing Agents, Sulfonated Oils and Assistants
	2844	Perfumes, Cosmetics, and Other Toilet Preparations
285		PAINTS, VARNISHES, LACQUERS, ENAMELS, AND ALLIED PRODUCTS
	2851	Paints, Varnishes, Lacquers, Enamels, and Allied Products
286		INDUSTRIAL ORGANIC CHEMICALS
	2861	Gum and Wood Chemicals
	2865	Cyclic (Coal Tar) Crudes, and Cyclic Intermediates, Dyes, and Organic Pigments (Lakes and Toners)
	2869	Industrial Organic Chemicals, Not Elsewhere Classified
287		AGRICULTURAL CHEMICALS
	2873	Nitrogenous Fertilizers
	2874	Phosphatic Fertilizers
	2875	Fertilizers, Mixing Only
	2879	Pesticides and Agricultural Chemicals, Not Elsewhere Classified
289		MISCELLANEOUS CHEMICAL PRODUCTS
	2891	Adhesives and Sealants
	2892	Explosives
	2893	Printing Ink
	2895	Carbon Black
	2899	Chemicals and Chemical Preparations, Not Elsewhere Classified

Major Group 29.—PETROLEUM REFINING AND RELATED INDUSTRIES

291		PETROLEUM REFINING
	2911	Petroleum Refining
295		PAVING AND ROOFING MATERIALS
	2951	Paving Mixtures and Blocks
	2952	Asphalt Felts and Coatings
299		MISCELLANEOUS PRODUCTS OF PETROLEUM AND COAL
	2992	Lubricating Oils and Greases
	2999	Products of Petroleum and Coal, Not Elsewhere Classified

Major Group 30.—RUBBER AND MISCELLANEOUS PLASTICS PRODUCTS

301		TIRES AND INNER TUBES
	3011	Tires and Inner Tubes
302		RUBBER AND PLASTICS FOOTWEAR
	3021	Rubber and Plastics Footwear

3-99

303		RECLAIMED RUBBER
	3031	Reclaimed Rubber
304		RUBBER AND PLASTICS HOSE AND BELTING
	3041	Rubber and Plastics Hose and Belting
306		FABRICATED RUBBER PRODUCTS, NOT ELSEWHERE CLASSIFIED
	3069	Fabricated Rubber Products, Not Elsewhere Classified
307		MISCELLANEOUS PLASTICS PRODUCTS
	3079	Miscellaneous Plastics Products

Major Group 31.—LEATHER AND LEATHER PRODUCTS

311		LEATHER TANNING AND FINISHING
	3111	Leather Tanning and Finishing
313		BOOT AND SHOE CUT STOCK AND FINDINGS
	3131	Boot and Shoe Cut Stock and Findings
314		FOOTWEAR, EXCEPT RUBBER
	3142	House Slippers
	3143	Men's Footwear, Except Athletic
	3144	Women's Footwear, Except Athletic
	3149	Footwear, Except Rubber, Not Elsewhere Classified
315		LEATHER GLOVES AND MITTENS
	3151	Leather Gloves and Mittens
316		LUGGAGE
	3161	Luggage
317		HANDBAGS AND OTHER PERSONAL LEATHER GOODS
	3171	Women's Handbags and Purses
	3172	Personal Leather Goods, Except Women's Handbags and Purses
319		LEATHER GOODS, NOT ELSEWHERE CLASSIFIED
	3199	Leather Goods, Not Elsewhere Classified

Major Group 32.—STONE, CLAY, GLASS, AND CONCRETE PRODUCTS

321		FLAT GLASS
	3211	Flat Glass
322		GLASS AND GLASSWARE, PRESSED OR BLOWN
	3221	Glass Containers
	3229	Pressed and Blown Glass and Glassware, Not Elsewhere Classified
323		GLASS PRODUCTS, MADE OF PURCHASED GLASS
	3231	Glass Products, Made of Purchased Glass
324		CEMENT, HYDRAULIC
	3241	Cement, Hydraulic
325		STRUCTURAL CLAY PRODUCTS
	3251	Brick and Structural Clay Tile
	3253	Ceramic Wall and Floor Tile
	3255	Clay Refractories

- 3259 Structural Clay Products, Not Elsewhere Classified
- 326 POTTERY AND RELATED PRODUCTS
- 3261 Vitreous China Plumbing Fixtures and China and Earthenware Fittings and Bathroom Accessories
- 3262 Vitreous China Table and Kitchen Articles
- 3263 Fine Earthenware (Whiteware) Table and Kitchen Articles
- 3264 Porcelain Electrical Supplies
- 3269 Pottery Products, Not Elsewhere Classified
- 327 CONCRETE, GYPSUM, AND PLASTER PRODUCTS
- 3271 Concrete Block and Brick
- 3272 Concrete Products, Except Block and Brick
- 3273 Ready-Mixed Concrete
- 3274 Lime
- 3275 Gypsum Products
- 328 CUT STONE AND STONE PRODUCTS
- 3281 Cut Stone and Stone Products
- 329 ABRASIVE, ASBESTOS, AND MISCELLANEOUS NONMETALLIC MINERAL PRODUCTS
- 3291 Abrasive Products
- 3292 Asbestos Products
- 3293 Gaskets, Packing, and Sealing Devices
- 3295 Minerals and Earths, Ground or Otherwise Treated
- 3296 Mineral Wool
- 3297 Nonclay Refractories
- 3299 Nonmetallic Mineral Products, Not Elsewhere Classified

Major Group 33.—PRIMARY METAL INDUSTRIES

- 331 BLAST FURNACES, STEEL WORKS, AND ROLLING AND FINISHING MILLS
- 3312 Blast Furnaces (Including Coke Ovens), Steel Works, and Rolling Mills
- 3313 Electrometallurgical Products
- 3315 Steel Wire Drawing and Steel Nails and Spikes
- 3316 Cold Rolled Steel Sheet, Strip, and Bars
- 3317 Steel Pipe and Tubes
- 332 IRON AND STEEL FOUNDRIES
- 3321 Gray Iron Foundries
- 3322 Malleable Iron Foundries
- 3324 Steel Investment Foundries
- 3325 Steel Foundries, Not Elsewhere Classified
- 333 PRIMARY SMELTING AND REFINING OF NONFERROUS METALS
- 3331 Primary Smelting and Refining of Copper
- 3332 Primary Smelting and Refining of Lead
- 3333 Primary Smelting and Refining of Zinc
- 3334 Primary Production of Aluminum
- 3339 Primary Smelting and Refining of Nonferrous Metals, Not Elsewhere Classified
- 334 SECONDARY SMELTING AND REFINING OF NONFERROUS METALS
- 3341 Secondary Smelting and Refining of Nonferrous Metals

- 335 ROLLING, DRAWING, AND EXTRUDING OF NONFERROUS METALS
- 3351 Rolling, Drawing, And Extruding of Copper
- 3353 Aluminum Sheet, Plate, and Foil
- 3354 Aluminum Extruded Products
- 3355 Aluminum Rolling and Drawing, Not Elsewhere Classified
- 3356 Rolling, Drawing, and Extruding of Nonferrous Metals, Except Copper and Aluminum
- 3357 Drawing and Insulating of Nonferrous Wire
- 336 NONFERROUS FOUNDRIES (CASTINGS)
- 3361 Aluminum Foundries (Castings)
- 3362 Brass, Bronze, Copper, Copper Base Alloy Foundries (Castings)
- 3369 Nonferrous Foundries (Castings), Not Elsewhere Classified
- 339 MISCELLANEOUS PRIMARY METAL PRODUCTS
- 3398 Metal Heat Treating
- 3399 Primary Metal Products, Not Elsewhere Classified

Major Group 34.—FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND TRANSPORTATION EQUIPMENT

- 341 METAL CANS AND SHIPPING CONTAINERS
- 3411 Metal Cans
- 3412 Metal Shipping Barrels, Drums, Kegs, and Pails
- 342 CUTLERY, HAND TOOLS, AND GENERAL HARDWARE
- 3421 Cutlery
- 3423 Hand and Edge Tools, Except Machine Tools and Hand Saws
- 3425 Hand Saws and Saw Blades
- 3429 Hardware, Not Elsewhere Classified
- 343 HEATING EQUIPMENT EXCEPT ELECTRIC AND WARM AIR; AND PLUMBING FIXTURES
- 3431 Enameled Iron and Metal Sanitary Ware
- 3432 Plumbing Fixture Fittings and Trim (Brass Goods)
- 3433 Heating Equipment, Except Electric and Warm Air Furnaces
- 344 FABRICATED STRUCTURAL METAL PRODUCTS
- 3441 Fabricated Structural Metal
- 3442 Metal Doors, Sash, Frames, Molding, and Trim
- 3443 Fabricated Plate Work (Boiler Shops)
- 3444 Sheet Metal Work
- 3446 Architectural and Ornamental Metal Work
- 3448 Prefabricated Metal Buildings and Components
- 3449 Miscellaneous Metal Work
- 345 SCREW MACHINE PRODUCTS, AND BOLTS, NUTS, SCREWS, RIVETS, AND WASHERS
- 3451 Screw Machine Products

- 3452 Bolts, Nuts, Screws, Rivets, and Washers
 346 METAL FORGINGS AND STAMPINGS
 3462 Iron and Steel Forgings
 3463 Nonferrous Forgings
 3465 Automotive Stampings
 3466 Crowns and Closures
 3469 Metal Stampings, Not Elsewhere Classified
 347 COATING, ENGRAVING, AND ALLIED SERVICES
 3471 Electroplating, Plating, Polishing, Anodizing and Coloring
 3479 Coating, Engraving, and Allied Services, Not Elsewhere Classified
 348 ORDNANCE AND ACCESSORIES, EXCEPT VEHICLES AND GUIDED MISSILES
 3482 Small Arms Ammunition
 3483 Ammunition, Except for Small Arms, Not Elsewhere Classified
 3484 Small Arms
 3489 Ordnance and Accessories, Not Elsewhere Classified
 349 MISCELLANEOUS FABRICATED METAL PRODUCTS
 3493 Steel Springs, Except Wire
 3494 Valves and Pipe Fittings, Except Plumbers' Brass Goods
 3495 Wire Springs
 3496 Miscellaneous Fabricated Wire Products
 3497 Metal Foil and Leaf
 3498 Fabricated Pipe and Fabricated Pipe Fittings
 3499 Fabricated Metal Products, Not Elsewhere Classified

Major Group 35.—MACHINERY, EXCEPT ELECTRICAL

- 351 ENGINES AND TURBINES
 3511 Steam, Gas, and Hydraulic Turbines and Turbine Generator Set Units
 3519 Internal Combustion Engines, Not Elsewhere Classified
 352 FARM AND GARDEN MACHINERY AND EQUIPMENT
 3523 Farm Machinery and Equipment
 3524 Garden Tractors and Lawn and Garden Equipment
 353 CONSTRUCTION, MINING, AND MATERIALS HANDLING MACHINERY AND EQUIPMENT
 3531 Construction Machinery and Equipment
 3532 Mining Machinery and Equipment, Except Oil Field Machinery and Equipment
 3533 Oil Field Machinery and Equipment
 3534 Elevators and Moving Stairways
 3535 Conveyors and Conveying Equipment
 3536 Hoists, Industrial Cranes, and Monorail Systems
 3537 Industrial Trucks, Tractors, Trailers, and Stackers
 354 METALWORKING MACHINERY AND EQUIPMENT
 3541 Machine Tools, Metal Cutting Types

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- 3542 Machine Tools, Metal Forming Types
 3544 Special Dies and Tools, Die Sets, Jigs and Fixtures, and Industrial Molds
 3545 Machine Tool Accessories and Measuring Devices
 3546 Power Driven Hand Tools
 3547 Rolling Mill Machinery and Equipment
 3549 Metalworking Machinery, Not Elsewhere Classified
 SPECIAL INDUSTRY MACHINERY, EXCEPT METALWORKING MACHINERY
 3551 Food Products Machinery
 3552 Textile Machinery
 3553 Woodworking Machinery
 3554 Paper Industries Machinery
 3555 Printing Trades Machinery and Equipment
 3559 Special Industry Machinery Not Elsewhere Classified
 GENERAL INDUSTRIAL MACHINERY AND EQUIPMENT
 3561 Pumps and Pumping Equipment
 3562 Ball and Roller Bearings
 3563 Air and Gas Compressors
 3564 Blowers and Exhaust and Ventilation Fans
 3565 Industrial Patterns
 3566 Speed Changers, Industrial High Speed Drives, and Gears
 3567 Industrial Process Furnaces and Ovens
 3568 Mechanical Power Transmission Equipment, Not Elsewhere Classified
 3569 General Industrial Machinery and Equipment, Not Elsewhere Classified
 OFFICE, COMPUTING, AND ACCOUNTING MACHINES
 3572 Typewriters
 3573 Electronic Computing Equipment
 3574 Calculating and Accounting Machines, Except Electronic Computing Equipment
 3576 Scales and Balances, Except Laboratory
 3579 Office Machines, Not Elsewhere Classified
 REFRIGERATION AND SERVICE INDUSTRY MACHINERY
 3581 Automatic Merchandising Machines
 3582 Commercial Laundry, Dry Cleaning, and Pressing Machines
 3585 Air Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment
 3586 Measuring and Dispensing Pumps
 3589 Service Industry Machines, Not Elsewhere Classified
 MISCELLANEOUS MACHINERY, EXCEPT ELECTRICAL
 3592 Carburetors, Pistons, Piston Rings, and Valves
 3599 Machinery, Except Electrical, Not Elsewhere Classified

**Major Group 36.—ELECTRICAL AND
ELECTRONIC MACHINERY, EQUIPMENT, AND
SUPPLIES**

- 361 ELECTRIC TRANSMISSION AND DISTRIBUTION EQUIPMENT
 - 3612 Power, Distribution, and Specialty Transformers
 - 3613 Switchgear and Switchboard Apparatus
- 362 ELECTRICAL INDUSTRIAL APPARATUS
 - 3621 Motors and Generators
 - 3622 Industrial Controls
 - 3623 Welding Apparatus, Electric
 - 3624 Carbon and Graphite Products
 - 3629 Electrical Industrial Apparatus, Not Elsewhere Classified
- 363 HOUSEHOLD APPLIANCES
 - 3631 Household Cooking Equipment
 - 3632 Household Refrigerators and Home and Farm Freezers
 - 3633 Household Laundry Equipment
 - 3634 Electric Housewares and Fans
 - 3635 Household Vacuum Cleaners
 - 3636 Sewing Machines
 - 3639 Household Appliances, Not Elsewhere Classified
- 364 ELECTRIC LIGHTING AND WIRING EQUIPMENT
 - 3641 Electric Lamps
 - 3643 Current-Carrying Wiring Devices
 - 3644 Noncurrent-Carrying Wiring Devices
 - 3645 Residential Electric Lighting Fixtures
 - 3646 Commercial, Industrial, and Institutional Electric Lighting Fixtures
 - 3647 Vehicular Lighting Equipment
 - 3648 Lighting Equipment, Not Elsewhere Classified
- 365 RADIO AND TELEVISION RECEIVING EQUIPMENT, EXCEPT COMMUNICATION TYPES
 - 3651 Radio and Television Receiving Sets, Except Communication Types
 - 3652 Phonograph Records and Pre-recorded Magnetic Tape
- 366 COMMUNICATION EQUIPMENT
 - 3661 Telephone and Telegraph Apparatus
 - 3662 Radio and Television Transmitting, Signaling, and Detection Equipment and Apparatus
- 367 ELECTRONIC COMPONENTS AND ACCESSORIES
 - 3671 Radio and Television Receiving Type Electron Tubes, Except Cathode Ray
 - 3672 Cathode Ray Television Picture Tubes
 - 3673 Transmitting, Industrial, and Special Purpose Electron Tubes
 - 3674 Semiconductors and Related Devices
 - 3675 Electronic Capacitors
 - 3676 Resistors, for Electronic Applications
 - 3677 Electronic Coils, Transformers and Other Inductors
 - 3678 Connectors, for Electronic Applications
 - 3679 Electronic Components, Not Elsewhere Classified

- 369 MISCELLANEOUS ELECTRICAL MACHINERY, EQUIPMENT, AND SUPPLIES
 - 3691 Storage Batteries
 - 3692 Primary Batteries, Dry and Wet
 - 3693 Radiographic X-ray, Fluoroscopic X-ray, Therapeutic X-ray, and Other X-ray Apparatus and Tubes; Electromedical and Electrotherapeutic Apparatus
 - 3694 Electrical Equipment for Internal Combustion Engines
 - 3699 Electrical Machinery, Equipment, and Supplies, Not Elsewhere Classified

**Major Group 37.—TRANSPORTATION
EQUIPMENT**

- 371 MOTOR VEHICLES AND MOTOR VEHICLE EQUIPMENT
 - 3711 Motor Vehicles and Passenger Car Bodies
 - 3713 Truck and Bus Bodies
 - 3714 Motor Vehicle Parts and Accessories
 - 3715 Truck Trailers
- 372 AIRCRAFT AND PARTS
 - 3721 Aircraft
 - 3724 Aircraft Engines and Engine Parts
 - 3728 Aircraft Parts and Auxiliary Equipment, Not Elsewhere Classified
- 373 SHIP AND BOAT BUILDING AND REPAIRING
 - 3731 Ship Building and Repairing
 - 3732 Boat Building and Repairing
- 374 RAILROAD EQUIPMENT
 - 3743 Railroad Equipment
- 375 MOTORCYCLES, BICYCLES, AND PARTS
 - 3751 Motorcycles, Bicycles, and Parts
- 376 GUIDED MISSILES AND SPACE VEHICLES AND PARTS
 - 3761 Guided Missiles and Space Vehicles
 - 3764 Guided Missile and Space Vehicle Propulsion Units and Propulsion Unit Parts
 - 3769 Guided Missile and Space Vehicle Parts and Auxiliary Equipment, Not Elsewhere Classified
- 379 MISCELLANEOUS TRANSPORTATION EQUIPMENT
 - 3792 Travel Trailers and Campers
 - 3795 Tanks and Tank Components
 - 3799 Transportation Equipment, Not Elsewhere Classified

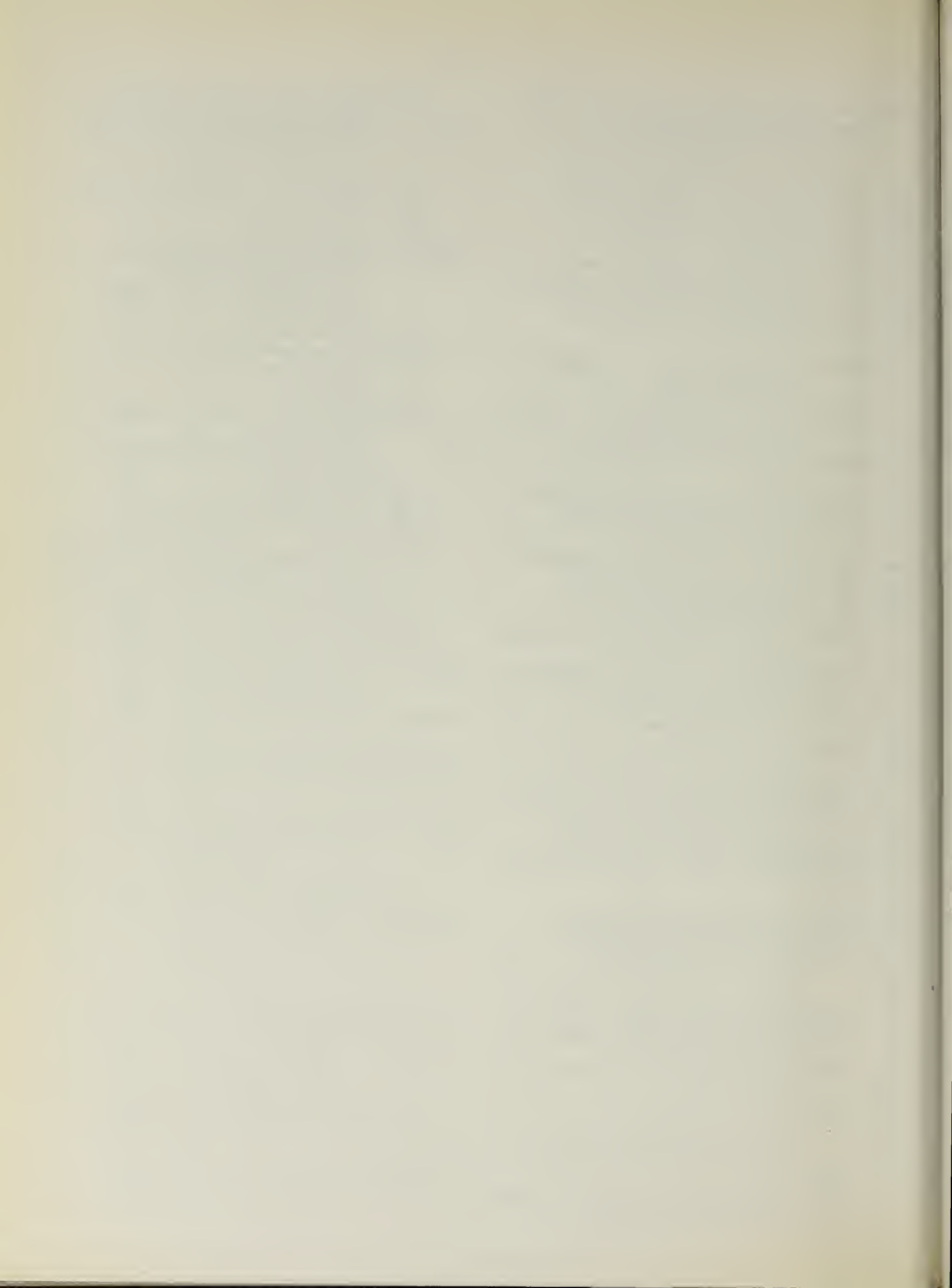
**Major Group 38.—MEASURING, ANALYZING,
AND CONTROLLING INSTRUMENTS;
PHOTOGRAPHIC, MEDICAL, AND OPTICAL
GOODS; WATCHES AND CLOCKS**

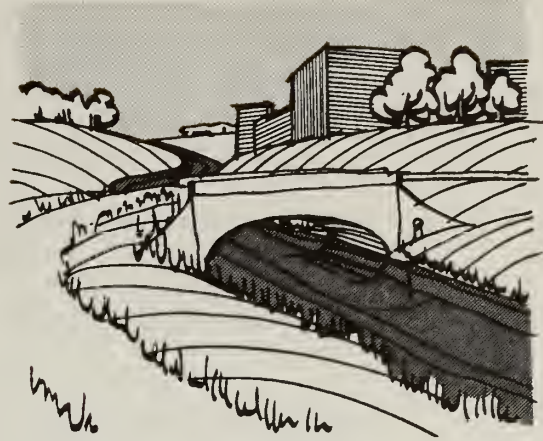
- 381 ENGINEERING, LABORATORY,
SCIENTIFIC, AND RESEARCH
INSTRUMENTS AND ASSOCIATED
EQUIPMENT
- 3811 Engineering, Laboratory, Scientific, and
Research Instruments and Associated
Equipment
- 392 MEASURING AND CONTROLLING
INSTRUMENTS
- 3822 Automatic Controls for Regulating
Residential and Commercial
Environments and Appliances
- 3823 Industrial Instruments for Measurement,
Display and Control of Process
Variables; and Related Products
- 3824 Totalizing Fluid Meters and Counting
Devices
- 3825 Instruments for Measuring and Testing of
Electricity and Electrical Signals
- 3829 Measuring and Controlling Devices, Not
Elsewhere Classified
- 383 OPTICAL INSTRUMENTS AND LENSES
- 3832 Optical Instruments and Lenses
- 384 SURGICAL, MEDICAL, AND DENTAL
INSTRUMENTS AND SUPPLIES
- 3841 Surgical and Medical Instruments and
Apparatus
- 3842 Orthopedic, Prosthetic, and Surgical
Appliances and Supplies
- 3843 Dental Equipment and Supplies
- 395 OPHTHALMIC GOODS
- 3851 Ophthalmic Goods
- 385 PHOTOGRAPHIC EQUIPMENT AND
SUPPLIES
- 3861 Photographic Equipment and Supplies
- 387 WATCHES, CLOCKS, CLOCKWORK
OPERATED DEVICES, AND PARTS
- 3873 Watches, Clocks, Clockwork Operated
Devices, and Parts

**Major Group 39.—MISCELLANEOUS
MANUFACTURING INDUSTRIES**

- 391 JEWELRY, SILVERWARE, AND PLATED
WARE
- 3911 Jewelry, Precious Metal
- 3914 Silverware, Plated Ware, and Stainless
Steel Ware
- 3915 Jewelers' Findings and Materials, and
Lapidary Work
- 393 MUSICAL INSTRUMENTS
- 3931 Musical Instruments
- 394 TOYS AND AMUSEMENT, SPORTING,
AND ATHLETIC GOODS
- 3942 Dolls
- 3944 Games, Toys, and Children's Vehicles;
Except Dolls and Bicycles

- 3949 Sporting and Athletic Goods, Not
Elsewhere Classified
- 395 PENS, PENCILS, AND OTHER OFFICE
AND ARTISTS' MATERIALS
- 3951 Pens, Mechanical Pencils, and Parts
- 3952 Lead Pencils, Crayons, and Artists'
Materials
- 3953 Marking Devices
- 3955 Carbon Paper and Inked Ribbons
- 396 COSTUME JEWELRY, COSTUME
NOVELTIES, BUTTONS, AND
MISCELLANEOUS NOTIONS, EXCEPT
PRECIOUS METAL
- 3961 Costume Jewelry and Costume Novelties,
Except Precious Metal
- 3962 Feathers, Plumes, and Artificial Trees
and Flowers
- 3963 Buttons
- 3964 Needles, Pins, Hooks and Eyes, and
Similar Notions
- 399 MISCELLANEOUS MANUFACTURING
INDUSTRIES
- 3991 Brooms and Brushes
- 3993 Signs and Advertising Displays
- 3995 Burial Caskets
- 3996 Linoleum, Asphalted-Felt-Base, and
Other Hard Surface Floor Coverings, Not
Elsewhere Classified
- 3999 Manufacturing Industries, Not Elsewhere
Classified





Section 2.4

Stormwater Management



7/11/1962

Page 12

PART II, SECTION 4 STORMWATER MANAGEMENT

In this section you will find:

- I. A discussion of the stormwater problems and the scope, purpose and approach used in this study.
- II. A discussion of alternative solutions to stormwater and combined sewer discharges including:
 - A) Non-structural alternatives - "Best Management Practices" (with cost estimates);
 - B) Structural Control Alternatives (with cost estimates).
- III. The identification of management agencies for implementation of stormwater management.

Implementation tools to control stormwater pollution are discussed in greater detail in: "Analysis of Urban Stormwater Runoff and Combined Sewer Overflows in the Boston Metropolitan Area" - available from MAPC.

I. STORMWATER RUNOFF IN THE BOSTON METROPOLITAN AREA

A. Purpose and Scope

The purpose of this study is to determine the magnitude and extent of water quality problems encountered in the MAPC 208 study area attributable to stormwater runoff within the context of other identified sources of water pollution; to evaluate the range of structural and non-structural measures available to treat/control runoff-related pollution problems and to recommend a program to control pollution due to stormwater runoff including an identification of the agency (or agencies) required to implement the recommended program.

The scope of this study includes the 92 communities within the designated MAPC-208 study area.

B. Problem Statement

1. Storm Sewers. Historically, storm sewers have been installed to channel stormwater runoff away from structures and dwellings and off streets and highways. These runoff collectors serve to protect public health and safety by minimizing danger from floods and diseases carried by polluted water. Concern over the water quality impacts of runoff has surfaced only within the last seven to ten years.

Stormwater runoff is a problem of increasing severity as it is essentially related to the process of urbanization. Urban growth and development bring about changes in the natural water cycle by increasing the area of impervious surface and thereby increasing the rate of runoff. Pollution from runoff occurs when precipitation flushes an urban or suburban area and carries pollutants to receiving waters. As the surface is flushed, polluted water flows overland to collection systems or directly to nearby surface water.

Stormwater runoff may contain substantial amounts of organic material, inorganic solids, nutrients, heavy metals and microorganisms which can have a significant impact on receiving water quality.

The total annual pollutant load in stormwater can be greater than the annual pollutant load discharged from municipal waste treatment facilities during dry weather. This fact could preclude meeting water quality goals regardless of the degrees or types of treatment provided for dry weather wastewater flows.

2. Combined Sewers. Those sewers which are designed to carry both sanitary sewage (wastewater) and stormwater in the same sewer are called combined sewers. During periods of dry weather, when wastewater and infiltration/inflow are the only contributors to the combined sewer, this dry weather flow (often referred to as "underflow") is typically routed to a wastewater treatment plant where it is treated prior to discharge. During periods of wet weather, however, when stormwater runoff is added to the wastewater flows in the combined sewer, the combined flow in the pipe often exceeds the capacity of the pipe to carry this total flow to a treatment plant. This results in what are known as combined sewer overflows, during which the excess flow in the sewer is discharged directly to a nearby water course through one or more overflow points built into the system. At the time when combined sewer systems were being constructed, such systems were considered cost-effective as one network of pipes would serve to "solve" two problems. A further local consideration was that as local streets would only have to be opened once instead of twice to install sewers, combined sewer construction would minimize disruptions of traffic and transportation-related services in an urban area. Water quality impacts of combined sewer overflows were considered at that time to be minimal as stormwater was considered "clean" water which would serve to dilute pollution levels associated with the wastewater component of the overflow volume. As urban areas served by combined sewers continued to grow, so did the pollution problems as overflows occurred more frequently.

Although combined sewers serve portions of only 7 of the 92 communities in the study area, they are responsible for the most seriously polluted waters found in the study area. These waters include Lynn Harbor, Boston Harbor, the Charles Basin, Muddy River, the Neponset River estuary, the Mystic River, Alewife Brook, Sweetwater Brook and the Chelsea River. Both the Muddy River and Alewife Brook are particular examples of the degrading impacts of combined sewer discharges. Both streams have undergone the transition from once-healthy tidal estuaries to open sewers, virtually incapable of supporting aquatic life. Swimming and other recreation uses, in addition to often severe limitations on shellfish harvesting in Boston Harbor and other North Coastal streams harbors, is frequently limited or precluded due to bacterial pollution from combined sewers.

C. Study Approach

Following an initial period of analysis of existing available information, including a review of available literature, the 208 staff concluded that at the present time, there is insufficient data on stormwater discharges and receiving water quality during wet weather periods upon which to determine the actual contribution of the stormwater pollution to the total pollution load affecting streams. Under these conditions, 208 staff developed a three stage approach to analyzing urban runoff in the 208 area.

As the first stage in the stormwater analysis, the firm of Camp, Dresser and McKee (CDM) was employed to inventory data on existing municipal stormwater collection systems. This data serves two purposes. This information should serve to direct communities as to where control practices should be applied and which practices are likely to be most effective. In addition to collecting information on the physical characteristics of identified drainage systems, CDM also identified current collection system maintenance and management practices. Based on all this information, non-structural "Best Management Practices" (BMP's) for controlling pollution from stormwater runoff were developed for each community. BMP's for stormwater runoff control can generally be applied to three possible control areas: the land surface, the road surface and in the storm drainage system. Controls applied to the land surface, such as erosion and sedimentation regulations, are most typically applied in new or developing areas and are not well suited for controlling existing problems. Examples of road surface and in-system controls are street-sweeping, street vacuuming, catch basin cleaning or vacuuming, neighborhood sanitation and brook channel maintenance. The inventory will also serve to focus wet weather data collection and analysis activities on particularly significant systems.

The second stage of the stormwater analysis was to quantify the water quality impacts on collection systems identified in the CDM inventory in order to identify significant systems.

A number of stormwater models were evaluated to accomplish this task. The model used is a hybrid of several simplified desk-top analysis techniques developed by 208 engineering staff. There are five components to the model used. They include the following:

- 1) Land Use - Existing and future land use determined from the DeFacto Land Use Pattern in order to calculate the coefficient of runoff, Cv. The methodology used to derive Cv was taken from EPA's Area-wide Assessment Procedures Manual for Urban Areas.
- 2) Hydrologic Parameters - Rainfall statistics including annual mean rainfall, number of storms per year, number of days of rain per year, mean depth of rain per event and average storm duration were collected from the National Oceanic and Atmospheric Administration's Environmental Data Center and used to determine the Design Storm, DS (in inches); the Design Storm Volume, DVSS (in million gallons, MG); and the Design Storm Duration, DSD (in days) using the statistical methods used in EPA's 1976 Needs Survey - Summaries of Technical Data for Combined Sewer Overflows and Stormwater Discharges.

- 3) Pollutant Loads - Pollution loads from stormwater discharges were developed for Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) using equations found in the EPA 1976 Needs Survey methodology.
- 4) Receiving Water Quality Impacts - Required Treatment Levels - A methodology was presented in the 1976 Needs Survey document which allows the user to determine the treatment levels required in order to meet receiving water quality standards. Although this methodology is available for use in the MAPC model, it was not used in this study due to serious data deficiencies which included lack of in-stream flow and water quality data and of in-stream reaeration rate, K_2 , data. Lack of this data and any other means to relate runoff loads to in-stream water quality seriously constrains the utility of the model's output. Until the missing data is supplied or another methodology is developed which will make that critical connection, decisions to apply structural, capital intensive control measures to stormwater systems cannot be either environmentally or economically justified.
- 5) Costs of Alternative Structural Controls - Capital and Operation and Maintenance Costs for five alternative structural controls plus disinfection were calculated using the 1976 Needs Survey cost algorithms. Alternatives include: Screening - Swirl Concentration, Sedimentation, Air Floatation with chemicals, Flocculation-Sedimentation, and Filtration. Disinfection costs were calculated separately and can be added to the costs of the five alternatives as appropriate.

The modeling results serve two purposes. First, they serve to identify particularly significant discharges based on discharge strength. Second, they provide first-cut, order-of-magnitude estimates of the cost for structural control alternatives. It is felt that an analysis tool of this kind will be of valuable assistance to local officials, developers, planners and conservationists.

The third stage of the program involved the development and operation of a storm drain sampling program to collect and analyze samples of storm-water runoff to determine stormwater loadings under actual field conditions during several rainfall events. Over 300 of the stormwater discharges identified by CDM were field inspected to evaluate access, outfall conditions and amenability to sampling in the Mystic, Lower Charles and Neponset Rivers. The results of those field surveys led to the selection of five sampling stations in the Mystic Basin. Each of these stations was sampled during three to five rainstorms between September 1, 1977 and November 1, 1977. This data will be useful in determining land use-water quality relationships, event-specific loadings and time variance, and in developing loading functions for future use in runoff-water quality models.

II. ALTERNATIVE SOLUTIONS TO STORMWATER AND COMBINED SEWER DISCHARGES

A. Introduction

The objective of stormwater management is to reduce the negative impact of runoff on water quality to an acceptable level at an acceptable cost. In order to fully comply with this objective, it is necessary to determine what constitutes an acceptable level.

Due to the lack of quantitative data on the quality of stormwater runoff as well as information on receiving water quality, determination of an acceptable level may be the most significant roadblock to the development of an effective stormwater management program. It should be noted that the state-of-the-art in stormwater management is still in its relative infancy. Therefore, the emphasis for control and management of stormwater runoff should be on short-term "Best Management Practices" as opposed to structural solutions such as treatment and/or storage. In the meantime, efforts to collect and analyze wet weather data to determine acceptable levels and to evaluate the need and cost-effectiveness of alternative structural solutions must be continued at the federal, state and local levels.

In contrast to this, the objective of combined sewer overflow control and management is the minimization and/or elimination of the health risks associated with the discharge of raw, untreated sewage into the environment with regard to the spread of disease through either direct contact or via shellfish contamination in addition to protecting recreational and other high quality water uses from both the decidedly negative water quality and aesthetic impacts of combined sewer discharges. Structural controls or structural controls applied together with "Best Management Practices" are required to comply with these objectives.

B. Control Alternatives - A General Discussion

Control alternatives are often referred to in terms of the overall location of their application in a given drainage area and system. Generally, the four areas where controls can be applied are:

- 1) Land surface: land use and erosion and sediment controls can be applied to prevent pollutant transport off the land surface (non-structural)
- 2) Road surface: where street maintenance and street sweeping or vacuuming can be used to remove accumulated pollutants prior to entering the storm drain system (non-structural)
- 3) In-system: such as catch-basin cleaning and vacuuming or sewer flushing (considered non-structural)
- 4) End-of-pipe: controls such as storage and treatment, settling basins or routing to a treatment plant (structural).

Controls can also be described in terms of their applicability before, during and after development and its associated activities such as construction. Controls which can be applied before and/or during development activities are

considered primarily preventive measures. These are generally limited to land surface controls. Controls associated with the remaining three areas of application are typically corrective measures.

A program of Best Management Practices (BMP's) for stormwater management would most likely involve a combination of approaches from among the four presented. Land surface controls, however, are more likely to be applied in newly developing areas or during future development where implementation coincides with design and construction of new facilities. End-of-pipe controls are generally regarded as long-term solutions pending evaluation of their cost-effectiveness. This leaves road surface and in-system controls for immediate and short-term implementation in stormwater management programs.

A further consideration in selecting BMP's for stormwater management is that runoff problems are amenable to multi-purpose solutions. A multi-purpose approach recognizes that water quality is an important consideration but not the only one. Erosion control, flood control, water supply enhancement, protection of public health, increased recreational opportunities and aesthetic amenities are also important beneficial impacts of runoff control and management.

The ultimate goal of stormwater management is to keep water in its basin of origin. One possible solution is to channel runoff from developed areas to areas suitable for groundwater recharge. This keeps water in its basin of origin, available for other uses such as water supply and maintaining and regulating stream flow. Publicly-financed abatement programs directed primarily toward water quality have been difficult to justify economically. The multi-purpose approach to stormwater runoff management allows linkages with other environmental management objectives and programs and promotes integrated, cost-effective solutions to a multi-faceted problem.

The key to the MAPC 208 stormwater management program will be the development of BMP programs representing the optimum combination of common sense and available public dollars. This can probably best be achieved by combining the various control measures with multi-purpose projects together with a continuing program of technical assistance and public education beyond the initial 208 time frame.

C. Non-Structural Control Alternatives - "Best Management Practices"

As identified in the previous discussion, BMP's can be developed in incorporating compatible, complimentary control measures to be applied at appropriate points in the drainage system into an overall management system.

Control measures which apply to the land surface include both regulatory and physical controls. Incorporation of runoff considerations in local subdivision regulations, requiring the filing of drainage plans with the community review boards prior to constructing specification of water quality considerations and methodologies in addition to flooding considerations for developers to comply with, and specification of requirements to maximize the natural drainage characteristics of sites to control runoff are all examples of regulating controls which can, if implemented, go a long way in terms of preventing water quality problems due to runoff. As an example

TABLE 4-1
Control Measures and Problem Areas

• INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS.		Slopes	Streams and waterways	Surface drainageways	Enclosed drainage	Large flat surface areas	Borrow and stockpile areas	Adjacent properties
Control Measure								
VEGETATIVE MEASURES	Minimization of stripped areas	•				•	•	
	Grubbing omitted	•				•		•
	Conservation of topsoil	•				•	•	
	Temporary mulching and/or seeding	•		•		•	•	•
	Seeding	•		•		•	•	•
	Mulches	•				•	•	
	Seeding with mulch and/or matting	•		•			•	•
	Hydroseeding	•		•		•	•	•
	Sodding	•		•		•	•	•
	Bio-technical protection of steep slopes	•						
DIVERSION MEASURES AND SLOPE DRAINS	Diversion berm	•					•	•
	Interceptor berm	•	•					•
	Diversion ditch	•					•	•
	Berm and ditch	•					•	•
	Slope drain	•						
MECHANICAL SLOPE STABILIZATION	Selective grading and shaping	•				•	•	•
	Roughened surface	•				•		
	Compaction	•				•		
	Benches or terraces	•					•	
	Retaining wall	•						•
	Seepage control	•						•
STREAM BANK STABILIZATION	Falls		•					
	Deflectors and jetties		•					
	Revetments		•					
	Bio-technical protection of stream banks		•					
	Checkdams		•					
	Weir		•					
SURFACE DRAINAGEWAYS	Bare channels			•				
	Grassed waterways			•				
	Lined channels			•				
	Grade control structures		•	•				
	Sediment trap		•	•				
	Sediment basin		•	•	•			
OTHER MEASURES	Filter inlet				•			•
	Aggregate cover					•		
	Curb and gutter					•		•
	Windbreak					•		
	Filter berm	•	•					•
	Traffic control on construction roads					•		

Source: Beckett Jackson Raeder Inc.

of the application of regulatory measures to prevent stormwater problems in a multi-purpose sense, Fairfax County, Maryland officials require complete review of all development plans prior to initiation of construction activities. A developer is allowed to develop any site in any approved configuration or density if the developer can demonstrate that the overall rate of runoff will remain the same after completion of the proposed development as it was before any development takes place. This addresses both water quality and water quantity considerations. Additional discussion of land use controls can be found in the MAPC 208 Preliminary Basin Reports.

Physical land surface control measures are designed primarily to control erosion and sedimentation during and after construction. Erosion occurs when the topsoil and vegetation are removed to allow grading, site preparation and other disruptive activities to occur. When rainfall hits the exposed subsoils, it results in washing away large quantities of soil. This process is known as erosion. Sedimentation occurs when eroded material settles out of the liquid stream on other land surfaces, wetlands or streams. Table 4-1 presents an extensive list of the various construction site erosion control measures and their approximate costs. As these controls are intended to be applied on a site-specific basis, there has been no attempt to apply these costs to the metropolitan area. Table 4-1 is presented to show the applicability of various control measures to particular problem areas.

Stream channel maintenance is an important preventive practice irregardless of the stage of development. The maintenance of existing vegetation on stream banks is a basic tenet of erosion and sedimentation control. Stream bank vegetation serves to stabilize the soil, slow runoff and reduce its erosive energy and to filter sediment from runoff. The more stable a stream, generally the greater its potential for fishing, wildlife and recreation. Actions which may result in stream bank stabilization include channel realignment, channel constriction, sedimentation of the streambed and increases its runoff volume. Structural stabilization of small sections of stream channels can result in serious erosion problems upstream and downstream. Structural stabilization controls are also expensive. Priorities should, therefore, be given to the implementation of stream maintenance practices.

Control measures applied to the road surface include street sweeping and/or vacuuming and the use of porous pavement. Although the use of porous pavement is clearly a structural activity, it is discussed here due to its relationship with road surface control measures.

The primary objective of street sweeping is to enhance the aesthetic appearance of streets by removing litter, debris, dust and dirt. As this practice does have an impact on the amount and type of roadway pollutants available to be washed off during storm events, street sweeping is a prime control measure for reducing stormwater pollution loads. The effectiveness of street sweeping is affected by several factors including the type and condition of pavement, the effectiveness of anti-litter and neighborhood sanitation programs, and the effect of air pollution in the urban areas. Generally, streets in good condition are cleaner than those in poor condition and concrete pavement tends to be cleaner than asphalt. Although litter control has a good effect on aesthetics, it has little effect on such water pollutants as BOD, pesticides, heavy metals and small particulates.

Street sweeping is typically accomplished by manual labor, mechanical sweepers, vacuum-type sweepers or combined vacuum and mechanical broom-type sweepers. Mechanical sweepers are most commonly used. These units basically consists of a gutter and main broom which rotate at high speeds forcing the debris from the gutter and street surface onto a conveyer belt and subsequently into a hopper. Water is usually sprayed on the surface for dust control.

Sweeper effectiveness is dependent upon a number of factors including particle size distribution, sweeping frequency, number of passes, equipment speed and pavement conditions. Table 4-2 shows the distribution of street surface pollutants, with particle size. Table 4-3 indicates the relationship between sweeper efficiency and particle size. Overall efficiency is around 50 percent.

Vacuum sweepers, although capable of reducing dust problems have not been shown to be any more efficient than mechanical sweepers due to the removal of fine particles. A relatively new technology, the regenerative air system may be the most efficient in removing fine particles.

Based on pilot study data, removal efficiencies might be greatly improved through the use of sweepers combining mechanical and vacuum sweeping. Under favorable conditions, such equipment might be capable of removing up to 90 percent of deposited solids and as much as 67 percent of BOD due to greater efficiency in the removal of smaller particle sizes.

The cost of street sweeping has been reported by several sources and varies from \$2 to \$14 per curb mile. A survey made by Sartor and Boyd showed that the frequency of sweeping ranged from 36 to 121 times per year in various urban U.S. cities. The average was 70 times/year, or every 5.2 days. These costs have been converted from \$/curb mile to \$/acre-year. This same range applies to both mechanical and vacuum sweepers. Cost data is not available for regenerative sweepers or combination mechanical-vacuum sweepers.

The use of porous pavement to improve infiltration of precipitation at the source prior to concentration is a technique considered to be still in the developmental stages. Its purpose is to increase infiltration and to reduce flood peaks. Advantages of porous pavement can be summarized as follows:

- 1) Reduces the total volume of runoff from paved areas;
- 2) Reduces the peaking effect of local floods;
- 3) Enhances groundwater supply;
- 4) Can result in savings resulting from the elimination of the need for storm sewers and curbing;
- 5) Can result in improvement in roadside vegetation due to improved water availability in the soil;
- 6) There would be some preservation of natural drainage patterns in the urban setting.

TABLE 4-2

STREET SURFACE POLLUTANTS ASSOCIATED
WITH VARIOUS PARTICLE SIZES

Measured Pollutant	<u>Particle Size</u>		
	<43 μ	43 μ -246 μ (% by weight)	>246 μ
TS	5.9	37.5	56.5
BOD ₅	24.3	32.5	43.2
COD	22.7	57.4	19.9
VS	25.6	34.0	40.4
Phosphates	56.2	36.0	7.8
Nitrates	31.9	45.1	23.0
Kjeldahl nitrogen	18.7	39.8	41.5
All heavy metals	51.2		48.7
All pesticides	73		27
PCB	34		66

TABLE 4-3

INTERRELATIONSHIP BETWEEN MECHANICAL
SWEEPER EFFICIENCY AND PARTICLE SIZE

<u>Particle Size</u> (microns)	<u>Sweeper Efficiency</u> (% removal)
2,000	79
840-2,000	66
246-840	60
104-246	48
43-104	20
<43	15
Overall	50

Disadvantages include:

- 1) It has not been clearly established that the filtering effect of the sub-base results in a significant improvement in the quality of runoff. In those instances where runoff can be severely polluted by substances which could reduce the quality of the groundwater, porous pavement should not be used;
- 2) Under certain circumstances, the surface can become clogged and its permeability reduced or eliminated. Examples of such conditions include inadequate maintenance, rain on a frozen surface, and certain conditions during snowmelt;
- 3) When the usual accessories of conventional paving are required (curbing, storm drains, etc.) the higher construction costs may affect other economic considerations;
- 4) A special maintenance program is required.

Although there may be cost savings due to elimination of curbs and stormwater drainage systems when porous pavement is used, the placement and sizing of storm sewerage systems is generally determined by ordinance in most municipalities. Porous pavement is a relatively new development and few local regulations permit its use. Even where it can be used, regulations may not permit any reduction in the size of storm drains.

The cost of porous pavement is roughly equivalent to the cost of conventional pavement but significantly less than conventional pavement equipped with storm drains. The relative costs of conventional and porous pavements are presented in Table 4-4. The potential advantage of using porous pavement appears to be good but many problems have yet to be fully resolved.

TABLE 4-4
COSTS OF CONVENTIONAL AND POROUS PAVEMENTS
(\$ per sq. yd.)

Type	Porous Pavement		Conventional Pavement	
	Range	Average	Range	Average
Parking Lot	8.43-8.53	8.48	4.87-7.75	6.31
Residential Street				
Low Capacity	8.44-8.49	8.47	6.40-12.80	9.60
High Capacity	8.25-8.75	8.51	11.13-16.13	13.64
Business Street				
Suburban	8.87-9.29	9.04	9.20-13.20	11.20
City	9.32-11.09	10.21	18.93-29.60	24.27
Rural Road	8.01-11.09	8.59	9.65-17.60	12.27
Highway, 2-lane	9.07-10.56	9.81	11.39-27.27	19.33

In-system controls include catch basin cleaning and sewer flushing. Both practices are considered applicable to combined sewer systems. However, due to cost and potentially negative impacts from the artificially created discharge, sewer flushing is not recommended for application in separate storm drain systems.

Catch basins were originally installed to minimize or prevent sewer clogging and to reduce odors. Catch basins were also important due to poor street surfaces, the use of flat grades, low flows in the sewer system and insufficient means of sewer cleaning. As improvements in street surfaces, self-cleaning velocities in sewers, street sweeping techniques and sewer cleaning techniques have developed and been implemented, the need for catch basins has theoretically been reduced. Studies by the APWA and AVCO have shown that in practice, there are an average of 60 catch basins per mile of street in U.S. cities. The average cleaning frequency for 299 cities was 2.3 times per year.

Catch basins are typically cleaned by mechanical means. Either a clam-shell type bucket or a vacuum cleaner are the most common methods. Although various studies have shown that catch basin cleaning is not likely to remove more than six percent of the stormwater BOD load, it is estimated to be capable of effecting up to 32 percent removal of the total solids load.

The average cost of catch basin cleaning, based on several studies, is reported to be \$10 per catch basin per cleaning. Assuming a cleaning frequency of 2.3 times per year, 60 catch basins per mile of street, 0.025 miles of street per acre, and a cost of \$10 per acre per year yields an average cost of \$34.50 per acre per year for catch basin cleaning. This computed cost will change in proportion to the number of cleanings per year as well as the number of catch basins cleaned in a given community. It is assumed that this represents a total annual cost per acre for mechanical catch basin cleaning.

Periodic sewer flushing has been proposed as a method of limiting the pollution load from combined sewers. The principle of sewer flushing is to maintain a consistently low level of BOD-exerting solids in the combined sewer system in order to minimize the pollutant impact when storms large enough to cause an overflow to occur flush the system. Flushing methods include automatic stations, in-line storage and portable tanker units.

An automatic flushing station technique designed by FMC Corporation for EPA involves the installation of a water-tight bag in existing manholes with pumps, valves and controls to draw screened wastewater from the sewer for storage in the inflatable bag. The stored wastewater is periodically released with sufficient energy to flush settled solids from the lateral sewer down stream from the flushing station.

In-line storage systems involve a system of internal dams which are used to back up the flow of sewage at critical upstream points for instantaneous release to scour downstream segments without creating an artificial flow. The tanker method simply involves either gravity or pressurized dumping of flush water into strategic manholes to provide scouring.

Recent studies in Boston have determined that 80 to 90 percent of the deposition of pollutants takes place in only 50 percent of the system. Through judicious analysis of the system to identify the most appropriate manholes in the system as flushing points, sewer flushing can effect from 60 to 75 percent removal of solids and BOD.

Due to limited application of these various technologies, cost data is limited. The automatic daily flushing system developed by FMC is estimated to cost \$1391 per acre per year which includes amortization of the capital cost of the system over twenty years at 6 percent interest plus operation and maintenance. The annual cost of daily flushing by the tanker method (manual labor approach) has been estimated at \$967 per acre per year. No estimates of the cost of in-line storage methods could be found in the literature.

Costs for Best Management Practices. The costs of implementing the recommended stormwater management plan's program of Best Management Practices was developed using the cost data for particular non-structural control alternatives. An average cost of \$50 per acre per year was assumed to incorporate recommendations for street sweeping, catch basin cleaning and stream maintenance for each community. This \$50 figure was generated using the low end of the ranges given for street sweeping and catch basin cleaning. Total annual costs were calculated by multiplying \$50 per acre per year by the total developed acres (residential, commercial and industrial) in each community. These costs are presented in Table 4-5.

Total developed acres for individual communities was derived from the MacConnell land use data from 1971. The low end of the cost range was used as there is insufficient information available from which cost curves that reflect variations in drainage system designs (i.e., number of catch basins per mile of street) with development densities can be developed. As such, costs indicated for urban communities can be considered fairly reasonable. Costs for suburban and rural communities are highly questionable and should be considered as "maximum" or "worst case" costs.

Almost all of the 92 communities are already performing one or more Best Management Practices. Due to the manner in which costs for performing these practices are portrayed in most municipal budgets, cost comparisons with the data in Table 4-5 was not possible. It is important to bear in mind however, that it is likely that a good portion of the costs shown in Table 4-5 are already included in public works budgets throughout the area.

Table 4 -5

TOTAL ANNUAL COST FOR BEST MANAGEMENT PRACTICES

<u>Community</u>	<u>Total Annual Cost</u>
Arlington	\$ 137,100
Chelsea	58,800
Everett	92,050
Malden	114,700
Medford	151,150
Melrose	94,000
Revere	116,800
Somerville	115,250
Stoneham	83,400
Winchester	107,800
Winthrop	44,350
Woburn	188,150
Bellingham	106,050
Belmont	95,400
Boston	1,026,300
Brookline	152,200
Cambridge	153,950
Dedham	150,000
Dover	134,900
Franklin	140,300
Holliston	93,650
Lexington	264,050
Lincoln	112,100
Medfield	81,300
Medway	66,950
Milford	128,450
Millis	47,050
Natick	178,800
Needham	201,100
Newton	392,300
Norfolk	48,650
Sherborn	46,200
Waltham	211,350
Watertown	99,050
Wellesley	193,300
Weston	167,550
Wrentham	67,400
Canton	153,900
Milton	166,900
Norwood	167,450
Quincy	252,700
Sharon	131,250
Stoughton	168,300
Walpole	151,400
Westwood	120,450
Acton	144,750
Ashland	73,500
Bedford	147,850
Concord	155,100
Framingham	344,000

Table 4-5 (cont.)

<u>Community</u>	<u>Total Annual Cost</u>
Hopkinton	\$ 101,950
Hudson	103,200
Littleton	91,500
Marlborough	169,800
Maynard	51,600
Southborough	76,350
Stow	57,000
Sudbury	156,450
Wayland	126,750
Burlington	188,850
Hamilton	86,600
Middleton	49,900
North Reading	90,100
Reading	129,650
Topsfield	68,250
Wenham	47,200
Wilmington	200,350
Beverly	182,200
Danvers	175,400
Lynn	181,600
Lynnfield	110,050
Manchester	77,950
Marblehead	96,800
Nahant	19,100
Peabody	234,000
Salem	105,450
Saugus	105,550
Swampscott	52,200
Wakefield	134,400
Duxbury	155,500
Hanover	128,950
Marshfield	187,500
Norwell	118,600
Rockland	91,850
Scituate	177,750
Braintree	196,150
Cohasset	84,850
Hingham	192,200
Holbrook	63,900
Hull	51,900
Randolph	148,600
Weymouth	257,500

D. Structural Control Alternatives

Five structural stormwater-combined sewer overflow control alternatives were considered in this 208 study. These technologies are considered to represent the state-of-the-art in field tested, implementable structural control options. Disinfection is listed as a separate category as disinfection may not necessarily be required for stormwater discharges whereas it is virtually a requirement for combined sewer overflow applications.

Table 4-6 lists the five control processes and disinfection together with the pollution reduction efficiencies associated with each. Figures 4-7 through 4-11 provide schematic flow diagrams of each alternative. Rather than go into a great deal of detail to describe each process individually, the reader is referred to the literature presented in the bibliography of this report.

Several communities have already undertaken large scale separation programs under which the combined sewers are separated into individual stormwater and wastewater sewers. Boston, Brookline, Cambridge and Somerville are among those who are or have separation programs in progress or completed. Separation is not considered cost-effective as a rule due to extremely high cost and due to the fact that a stormwater discharge remains which may or may not represent an improvement in receiving water quality.

Of the processes listed in Table 4-6, Alternative 2, Sedimentation together with disinfection have already been implemented in the Boston metropolitan area. Two detention (sedimentation)-chlorination disinfection facilities are currently being operated by the Metropolitan District Commission (MDC) at the Cottage Farm (BU Bridge) and Somerville Marginal Conduit Stormwater Detention and Chlorination Facilities. A third such facility is being constructed in conjunction with the new Charles River Dam. The MDC is in the process of developing a facilities plan for the control of several other combined sewer overflows in the Boston Harbor area.

The City of Boston has recently applied to EPA for a research and demonstration grant to evaluate the application of the swirl concentrator and helical bend regulator which is shown as Control Option 1 on Table 4-6.

Until such time as the relationship between the impacts of stormwater runoff discharges and receiving water quality has progressed to the point where true cost-effectiveness of structural control options can be determined, communities should focus on the implementation of best management practices for the control of stormwater discharges. Each of the structural and applicable best management practices described in this report (including sewer flushing) should be evaluated in detail in any Step 1 Facilities Plans initiated by any wastewater management entity in the MAPC 208 area specifically undertaken to control combined sewer overflows. Further, disinfection should be a required component of any combined sewer facility in order to protect high quality contact recreation waters and high quality and potential shellfish harvesting waters.

1. Costs of Alternative Structural Controls. Costs for the structural control alternatives are presented as total capital and total annual operation and maintenance costs in Tables 4-12 through 4-25.

TABLE 4-6
ESTIMATED CONTROL OPTION EFFICIENCY

Treatment or Control Option	Efficiency (% Removal)		
	BOD ₅	Sus.Solids	Fecal Coliform
1. Screening-Swirl Concentration swirl concentrator, storage, raw wastewater pumping, screening (stationary type), flow measurement, misc.	0-25	0-25	-
2. Sedimentation storage, raw wastewater pumping, sedimentation, flow measurement, misc.	25-40	25-50	-
3. Air Flootation w/Chemicals storage, raw wastewater pumping, rapid mix, chemical feed equip., air floatation, flow measurement, misc.	40-60	50-70	-
4. Flocculation-Sedimentation storage, raw pumping, chemical feed, rapid mix, flocculation, sedimentation, flow measurement, misc.	60-80	70-90	-
5. Filtration storage, raw pumping, chemical feed, rapid mix, flocculation, sedimentation, flow measurement, misc.	80-95	90-98	-
6. Disinfection gaseous chlorine storage & feeding to above options	-	-	99.9

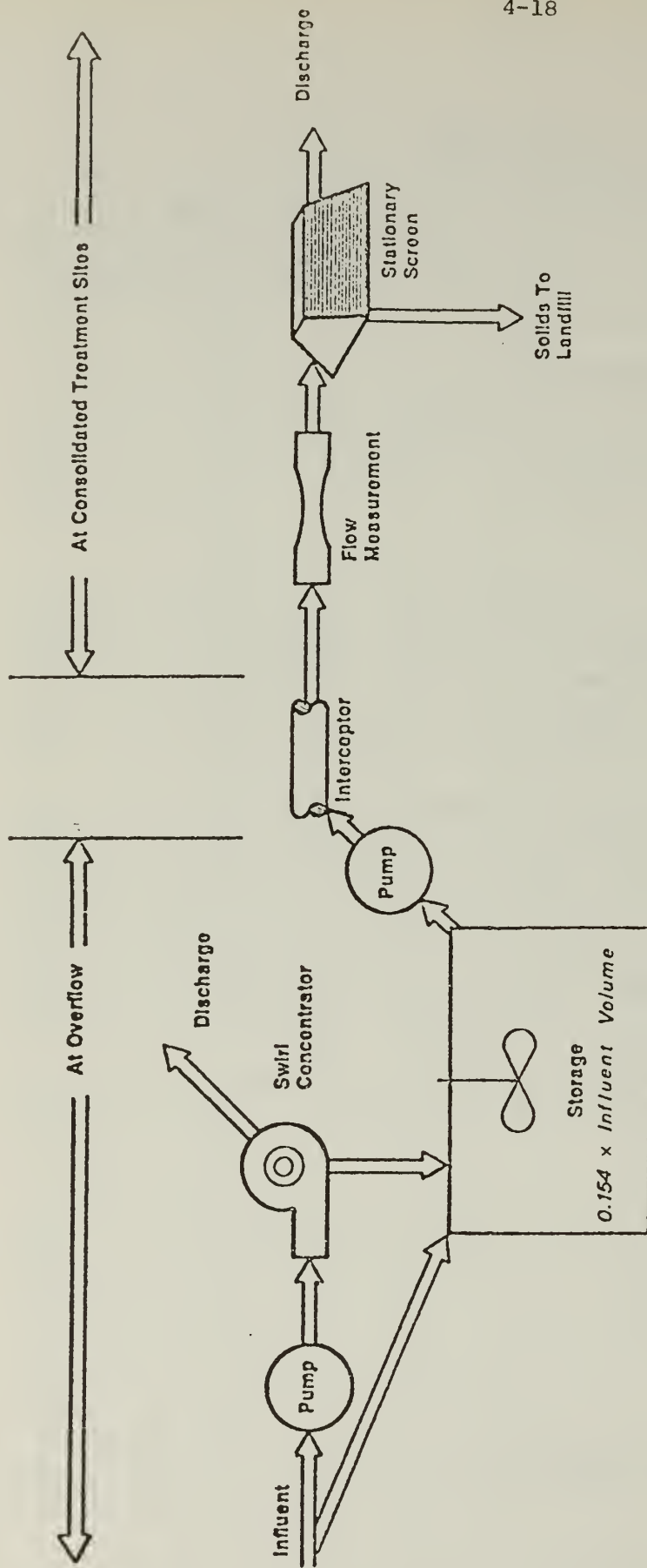


FIGURE 4-7
SCREENING — SWIRL CONCENTRATOR
FLOW SCHEMATIC

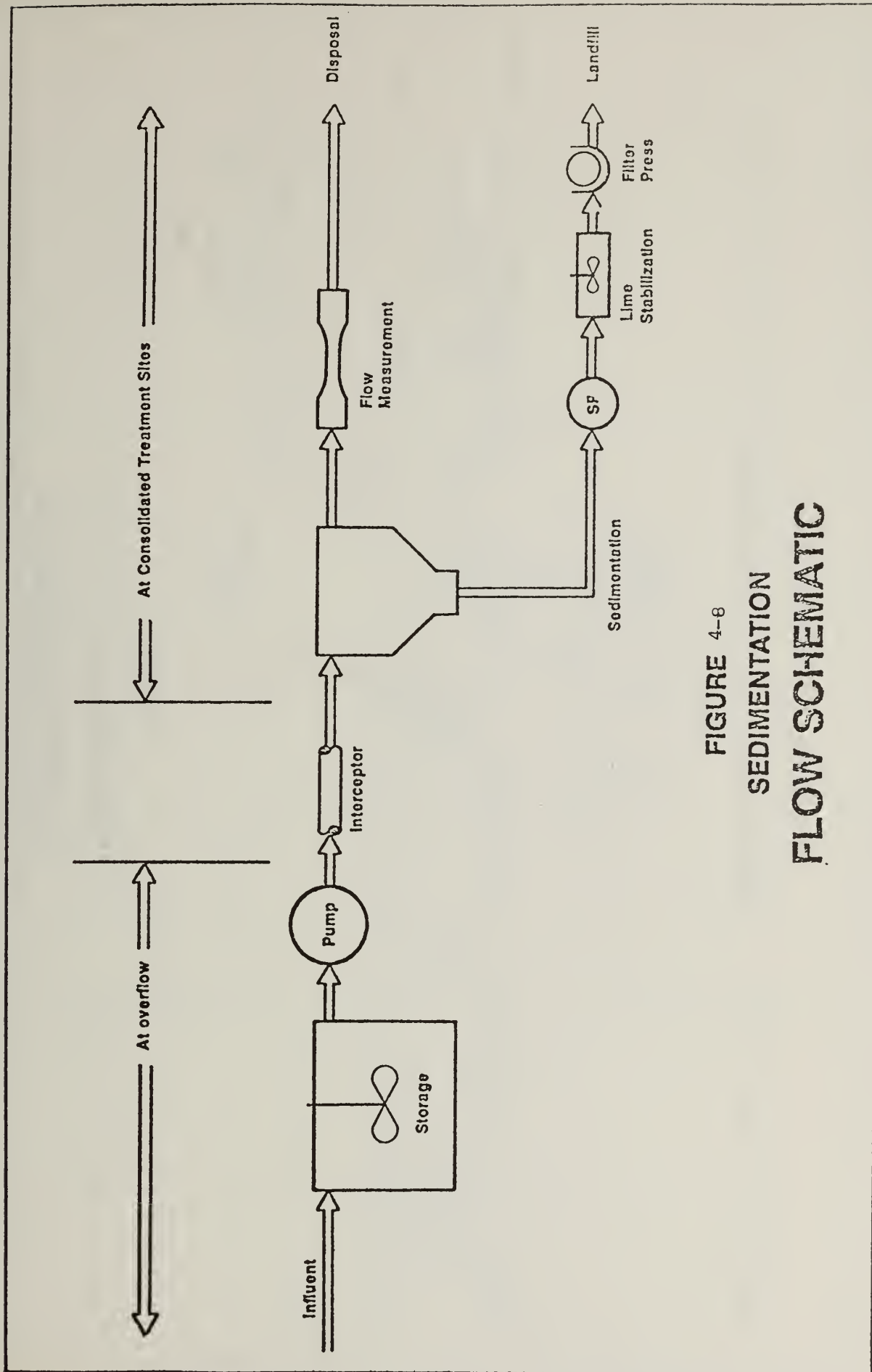


FIGURE 4-8
SEDIMENTATION
FLOW SCHEMATIC

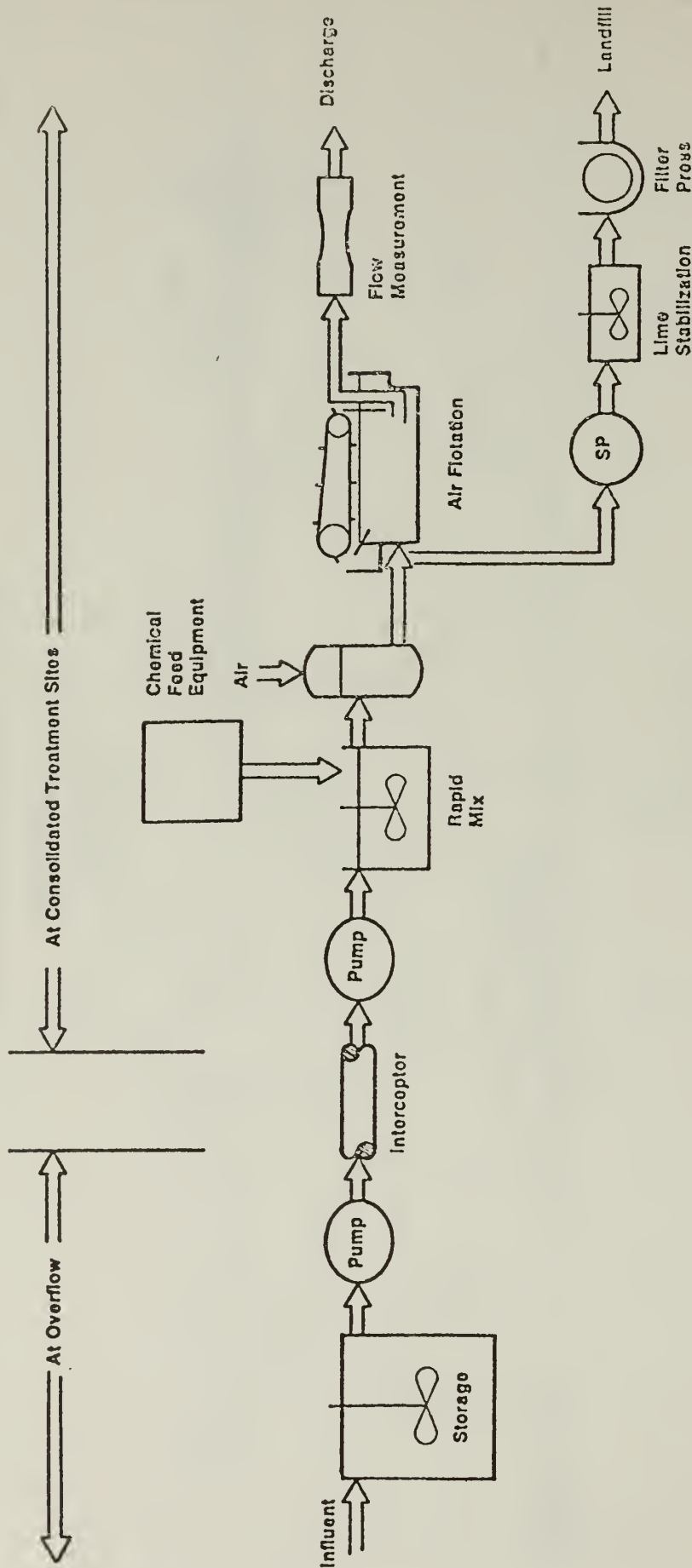


FIGURE 4-9
DISSOLVED AIR FLOTATION
FLOW SCHEMATIC

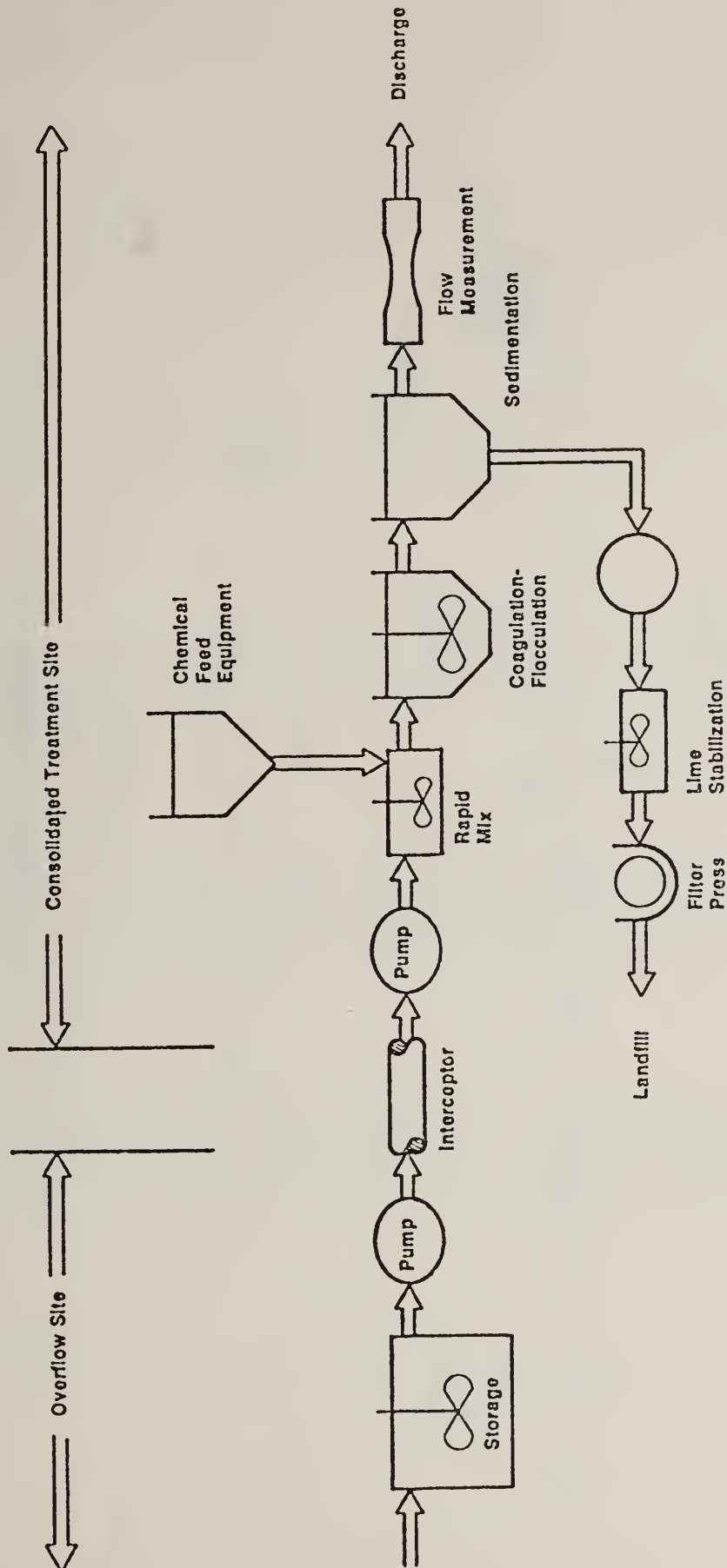


FIGURE 4-10
FLOCCULATION — SEDIMENTATION
FLOW SCHEMATIC

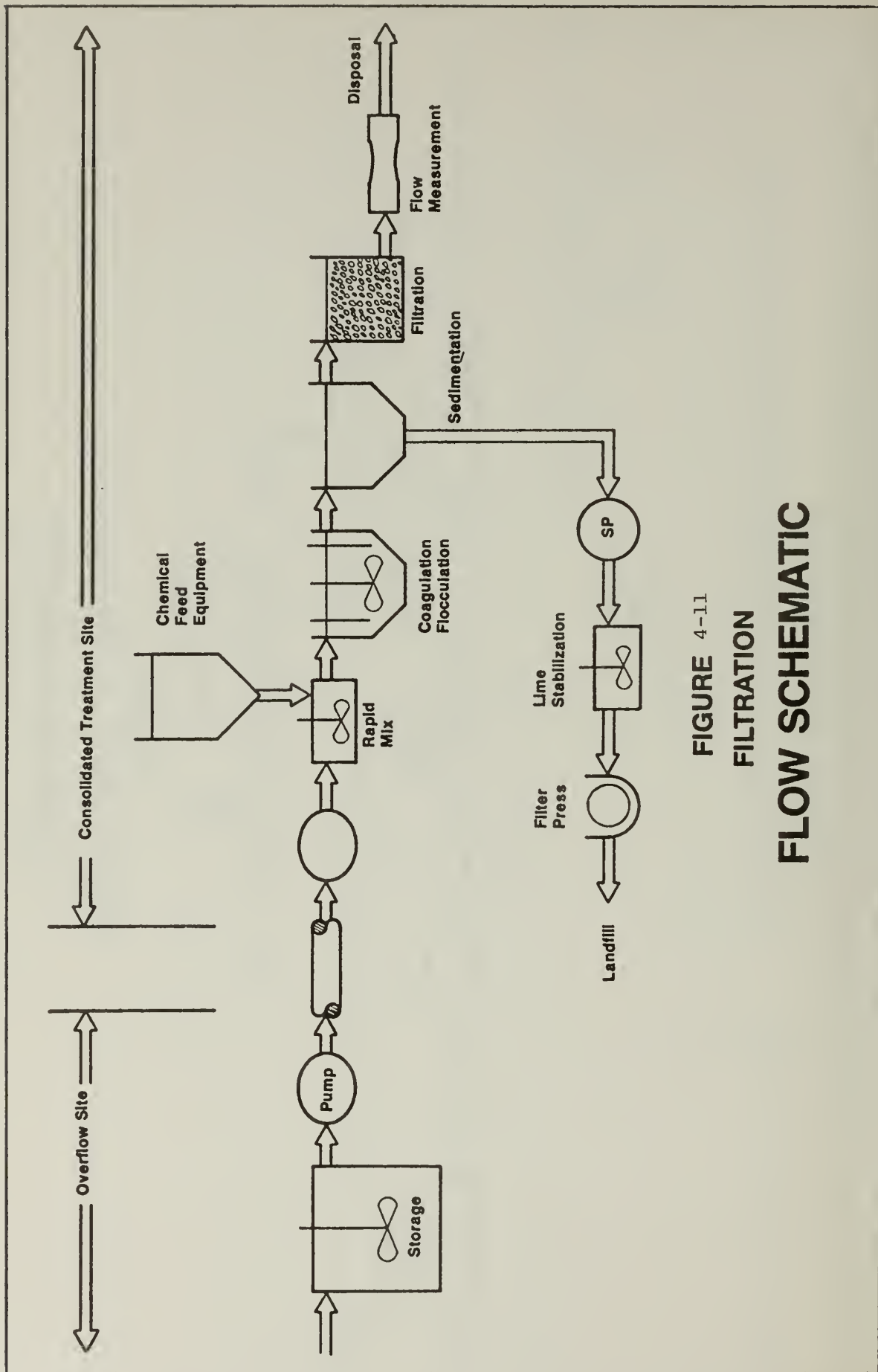


FIGURE 4-11

FILTRATION

FLOW SCHEMATIC

TABLE 4-12
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
ARLINGTON	A	243,500	477,900	552,600	517,500	566,300	83,100
	B	134,900	281,600	320,900	304,200	329,100	80,800
	C	162,400	332,600	380,600	359,500	390,400	81,400
	D	165,500	338,100	387,100	365,500	397,100	81,400
	E	113,300	420,700	273,200	259,700	280,200	80,400
	F	79,500	175,000	197,200	188,000	202,200	79,900
	G	330,600	627,900	732,200	680,700	749,500	85,100
	H	297,300	571,200	664,100	619,000	680,100	84,300
	I	184,900	373,500	428,900	404,000	439,800	81,800
	J	276,000	534,500	670,200	579,100	635,300	83,800
	K	221,100	438,300	505,500	474,400	518,200	82,600
	L	169,900	346,300	396,700	374,400	406,900	81,500
	M	292,400	562,800	654,000	609,800	669,800	84,200
	N	201,500	403,300	464,000	436,400	475,800	82,200
	O	285,100	550,200	638,900	596,100	654,400	84,000
	P	139,900	290,800	331,700	314,200	340,200	80,900
	Q	329,000	625,200	729,000	677,800	746,200	85,100
	R	351,200	662,600	774,100	718,600	792,200	85,600
	S	227,500	449,700	519,000	486,800	532,000	82,700
	T	136,500	284,600	324,400	307,400	332,800	80,900
MALDEN	A	191,200	384,900	442,300	416,400	453,500	81,900
	B	255,600	499,000	577,800	540,500	592,000	83,300
	C	557,200	999,400	1,184,700	1,085,600	1,203,600	91,100
	D	249,700	488,600	565,400	529,200	579,300	83,200
	E	198,700	398,400	458,200	431,100	469,800	82,200
	F	210,200	434,900	501,500	470,700	514,100	82,500
	G	241,200	473,700	547,600	513,000	561,200	83,000
	H	180,700	365,800	419,800	395,700	430,500	81,700

TABLE 4-12 (continued)
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOTATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
MEDFORD	A	693,000	1,212,800	1,448,400	1,318,300	1,474,700	95,000
	B	200,000	400,800	461,000	433,600	472,700	82,100
	C	598,600	1,065,100	1,265,600	1,157,200	1,290,300	92,200
	D	477,500	871,200	1,027,500	945,800	1,049,400	88,900
	E	159,500	327,100	374,200	353,600	383,800	81,300
	F	110,500	235,400	267,100	254,000	273,900	80,400
	G	111,300	237,000	268,900	255,800	275,800	80,400
	H	124,700	262,400	298,500	283,500	306,200	80,600
	I	428,200	790,800	929,400	858,200	950,000	87,500
	J	466,100	852,700	1,004,900	975,700	1,026,600	83,500
MELROSE	A	581,700	1,038,300	1,232,500	1,127,900	1,256,900	91,800
	B	295,200	567,500	659,600	615,000	675,500	84,200
	C	99,100	213,400	241,600	230,200	747,800	80,200
	D	488,800	889,500	1,049,800	965,800	1,072,100	89,200
	E	335,300	635,800	741,800	689,400	959,200	85,200
	F	238,100	408,400	541,200	507,100	554,700	82,900
	G	281,200	543,500	630,800	588,800	646,100	83,900
SOMERVILLE	B	568,500	1,017,400	1,206,800	1,105,200	1,230,900	91,400
	C	297,300	571,200	664,100	619,000	680,100	84,300
	E	295,700	568,300	660,700	615,900	676,600	84,300
	F	COMBINED SEWER SYSTEM					
	G	171,300	348,900	399,800	377,200	410,000	81,500
	H	COMBINED SEWER SYSTEM					
	I	700,300	1,224,100	1,452,500	1,330,600	1,488,800	95,200
	J	165,500	338,100	387,100	365,500	397,100	81,400

TABLE 4-12 (continued)
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
STONEHAM	A	241,700	474,700	548,800	514,000	562,400	83,000
	B	166,200	339,600	338,800	367,100	398,800	81,400
	D	206,100	411,600	473,800	445,500	485,800	82,300
	E	255,100	498,100	576,600	539,400	590,800	83,300
	F	406,400	754,700	885,600	818,900	905,500	87,000
	G	736,200	1,279,600	1,531,500	1,391,200	1,558,300	90,300
	H	397,800	740,500	868,400	808,400	888,000	86,800
WINCHESTER	A	214,000	425,700	490,600	460,700	502,900	82,400
	B	300,100	576,000	669,900	624,200	686,000	84,400
	C	386,300	721,500	845,300	782,600	864,500	86,500
	D	359,700	677,000	791,500	734,200	809,900	85,800
	E	227,500	449,700	519,000	486,800	532,000	82,700
	F	109,900	346,300	396,700	374,400	406,900	81,500
	G	183,500	371,100	425,900	401,300	436,800	81,800
	H	685,700	1,201,400	1,434,300	1,305,900	1,460,500	94,800
	I	678,300	1,190,000	1,420,100	1,293,400	1,446,200	94,600
	J	237,500	467,200	539,900	505,900	553,300	82,900
	K	167,700	342,200	391,900	370,000	402,000	81,500
	L	271,500	526,600	610,700	570,500	625,600	83,600
	M	236,800	466,100	538,500	504,600	551,900	82,900
	N	123,800	260,700	296,500	281,500	304,200	80,600
	O	103,000	221,000	250,400	238,400	256,800	80,300
	P						
WOBURN	B	667,200	1,172,700	1,398,700	1,274,600	1,424,600	94,300
	CD	578,500	1,033,200	1,226,300	1,122,400	1,250,600	91,700
	E	120,400	254,300	289,000	274,500	296,400	80,600
	F	202,800	405,900	466,800	438,900	478,600	82,200
	G	71,100	108,300	189,500	181,300	194,300	79,800
	H	383,900	717,500	840,400	778,300	859,600	86,400

TABLE 4-13
STRUCTURAL ALTERNATIVES - OPERATIONS AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
ARLINGTON	A	24,000	21,500	25,000	23,900	47,200	1,300
	B	22,100	18,100	20,500	19,800	43,000	800
	C	22,600	18,900	21,700	20,900	44,100	900
	D	22,700	19,000	21,800	21,000	44,200	900
	E	22,700	17,400	19,600	19,000	42,200	700
	F	20,900	16,400	18,200	17,700	40,800	500
	G	25,400	24,300	28,600	27,200	50,600	1,800
	H	24,900	23,200	27,200	26,000	49,300	1,600
	I	23,000	19,600	22,600	21,700	50,000	1,000
	J	24,500	22,500	26,300	25,100	48,500	1,500
	K	23,600	30,800	24,000	23,100	46,400	1,200
	L	22,800	19,200	22,000	21,100	44,400	1,000
	M	24,800	23,100	27,000	25,800	49,100	1,600
	N	23,300	20,100	23,200	22,300	45,600	1,100
	O	24,700	22,800	26,700	25,500	48,800	1,600
	P	22,200	18,200	20,700	20,000	43,200	800
	Q	25,300	24,300	28,500	27,200	50,600	1,800
	R	25,700	25,000	29,500	28,000	51,500	1,900
	S	23,800	21,000	24,300	23,300	26,600	1,300
	T	22,100	18,100	20,600	19,900	43,100	800
MALDEN	A	23,100	19,800	22,800	21,900	45,200	1,100
	B	24,200	21,900	25,500	24,400	47,700	1,400
	C	28,500	32,400	38,500	36,400	59,900	3,000
	D	24,100	21,700	25,200	24,100	47,500	1,400
	E	23,300	20,100	23,100	22,200	45,500	1,100
	F	23,600	20,700	24,000	23,000	46,300	1,200
	G	24,000	21,400	24,900	23,800	47,100	1,300
	H	23,000	19,500	22,400	21,500	44,800	1,000
	I	23,100	19,800	22,800	21,900	45,200	1,100

TABLE 4-13 (continued)
STRUCTURAL ALTERNATIVES - OPERATIONS AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
MEDFORD	A	30,200	37,600	44,800	42,100	65,700	3,600
	B	23,300	20,100	23,200	22,300	45,500	1,100
	C	29,000	33,900	40,400	38,100	61,700	3,200
	D	27,400	29,500	34,900	33,100	56,600	2,600
	E	33,600	18,800	21,500	20,700	44,000	900
	F	21,600	17,300	19,500	18,900	42,100	600
	G	21,600	17,400	19,600	18,900	42,100	600
	H	21,900	17,800	70,100	19,400	42,600	700
	I	26,800	17,700	32,800	31,100	54,600	2,300
	J	27,300	29,100	34,400	32,600	56,100	2,500
MELROSE	A	28,800	33,300	39,600	37,400	60,900	3,100
	B	24,800	23,200	27,100	25,900	49,200	1,600
	C	21,400	17,000	19,100	18,500	41,600	600
	D	27,600	29,900	35,400	33,500	57,000	2,600
	E	25,400	24,500	28,800	27,400	50,800	1,800
	F	23,900	21,300	24,700	23,700	47,000	1,300
	G	24,600	22,700	26,500	25,300	28,700	1,500
SOMERVILLE	B	28,600	32,800	39,000	36,800	60,400	3,000
	C	24,900	25,200	27,200	26,000	49,300	1,600
	E	24,800	23,200	27,100	25,900	49,300	1,600
	F	COMBINED SEWER SYSTEM					
	G	22,800	19,200	22,000	21,200	44,400	1,000
	H	COMBINED SEWER SYSTEM					
	I	30,300	37,900	45,100	42,400	66,100	3,700
	J	22,700	19,000	21,800	21,000	44,200	900

TABLE 4-13 (continued)
STRUCTURAL ALTERNATIVES - OPERATIONS AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
STONEHAM	A	24,000	21,400	24,900	23,800	47,200	1,300
	B	22,700	19,000	21,800	21,000	44,200	900
	D	23,400	20,300	23,400	22,500	45,800	1,200
	E	24,200	21,800	25,400	24,300	47,700	1,400
	F	26,500	26,900	31,800	30,700	53,700	2,200
	G	30,800	39,300	46,900	44,000	67,000	3,900
	H	26,300	26,600	31,400	29,900	53,300	2,100
WINCHESTER	A	23,500	20,500	23,800	22,800	26,100	1,200
	B	24,900	23,300	27,300	26,100	49,400	1,600
	C	26,200	26,200	30,900	29,400	52,900	2,100
	D	25,800	25,300	29,800	28,400	51,800	1,900
	E	23,800	21,000	24,300	23,300	46,000	1,300
	F	22,800	19,200	22,000	21,100	44,400	1,000
	G	23,000	19,600	22,500	21,600	44,900	1,000
	H	30,100	37,300	44,500	41,800	65,400	3,600
	I	30,000	37,000	44,100	41,500	65,100	3,600
	J	23,900	21,300	24,700	23,700	47,000	1,300
	K	22,700	19,100	21,900	21,000	44,300	900
	L	24,500	22,400	26,100	25,000	48,300	1,500
	M	23,900	21,300	24,700	23,600	47,000	1,300
	N	21,900	17,700	20,100	19,400	42,600	700
	O	21,500	17,100	19,200	18,600	41,800	600
WOBURN	B	29,900	36,600	43,600	41,000	64,600	3,500
	CD	28,800	33,200	39,500	37,200	60,800	3,100
	E	21,800	17,600	19,900	19,300	42,500	700
	F	23,300	20,200	23,300	22,400	45,900	1,100
	G	20,800	16,300	18,100	17,000	40,700	500
	H	26,100	26,200	30,800	29,300	52,800	2,100

TABLE 4-14
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
BELMONT	B	962,200.	1,621,900.	1,960,500.	1,764,000.	1,988,700.	103,600.
	C	629,600.	1,113,800.	1,325,700.	1,210,300.	1,351,000.	93,100.
	G	598,600.	1,065,100.	1,265,600.	1,157,200.	1,290,300.	92,200.
CAMBRIDGE	E	220,400.	437,100.	504,100.	473,900.	516,800.	82,600.
	F	563,300.	1,009,000.	1,196,500.	1,096,000.	1,220,500.	91,200.
LEXINGTON	H	110,500.	235,400.	267,100.	254,000.	273,900.	80,400.
	I	117,700.	249,200.	283,100.	269,000.	290,400.	80,500.
	J	177,900.	360,800.	413,800.	390,200.	424,400.	81,700.
	K	114,100.	242,200.	275,000.	261,500.	282,100.	80,500.
	L	254,400.	497,000.	575,300.	538,300.	589,500.	83,300.
	UV	1,081,200.	1,798,000.	2,183,200.	1,956,900.	2,211,300.	107,600.
NEWTON	A	476,600.	869,800.	1,025,800.	944,300.	1,047,700.	88,800.
	C	721,900.	1,257,000.	1,504,100.	1,367,200.	1,530,800.	95,900.
WALTHAM	F	262,100.	510,300.	591,300.	552,800.	605,800.	83,500.
	G	240,500.	472,600.	546,300.	511,700.	559,900.	83,000.
	I	380,500.	711,700.	833,500.	772,000.	852,500.	86,300.

TABLE 4-15
STRUCTURAL ALTERNATIVES - OPERATIONS AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOTATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
BELMONT	B	33,400.	48,600.	58,100.	54,200.	78,000.	5,000.
	C	29,400.	35,100.	41,800.	39,400.	63,000.	3,300.
	G	29,000.	33,900.	40,400.	38,100.	61,700.	3,200.
CAMBRIDGE	E	23,000.	20,700.	24,000.	23,000.	46,300.	1,200.
	F	28,600.	32,600.	38,800.	36,600.	60,200.	3,000.
LEXINGTON	H	21,600.	17,300.	19,500.	18,900.	42,100.	600.
	I	21,800.	17,600.	19,800.	19,200.	42,400.	700.
	J	22,900.	19,400.	22,300.	21,400.	44,700.	1,000.
	K	21,700.	17,400.	19,700.	19,000.	42,200.	700.
	L	24,200.	21,800.	25,400.	24,300.	47,700.	1,400.
	UV	34,800.	53,700.	64,200.	59,800.	83,600.	5,600.
							4-30
NEWTON	A	27,400.	29,400.	34,900.	33,000.	56,500.	2,500.
	C	30,000.	38,700.	46,200.	43,400.	67,000.	3,800.
WALTHAM	F	24,300.	22,100.	25,700.	24,600.	48,000.	1,400.
	G	24,000.	21,400.	24,800.	23,800.	47,100.	1,300.
	I	26,100.	27,000.	30,700.	29,200.	52,600.	2,100.

TABLE 4-16
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
CANTON	C	257,400.	502,100.	581,500.	543,900.	598,800.	83,400.
MILTON	B	233,700.	460,700.	532,100.	498,700.	545,300.	82,900.
	C	122,100.	257,500.	292,800.	278,000.	300,300.	80,600
	D	158,700.	325,500.	352,000.	352,000.	382,000.	81,300
NORWOOD	A	321,100.	611,900.	712,900.	663,300.	729,900	84,900.
	B	485,800.	884,700.	1,043,900.	960,500.	1,066,100.	89,100.
	C	184,900.	373,500.	428,900.	404,000.	439,800.	81,800.
	D	409,500.	417,000.	481,000.	452,000.	493,100.	82,300.
	E	151,000.	311,500.	355,900.	336,700.	365,100.	81,100.
	I	977,800.	1,645,100.	1,989,800.	1,780,000.	2,018,000.	104,100.
SHARON	E	239,300.	470,500.	543,800.	509,400.	557,300.	83,000.
	F	178,500.	361,900.	415,200.	391,400.	425,800.	81,700.
STOUGHTON	B	725,500.	1,263,100.	1,511,000.	1,373,200.	1,537,600.	96,000.
	C	239,300.	470,500.	543,800.	509,400.	557,300.	93,000.
WALPOLE	B	395,400.	736,600.	863,600.	799,100.	883,200.	86,700.
	I	217,900.	432,700.	498,800.	468,300.	511,300.	82,500.
	J	332,700.	631,400.	736,500.	684,600.	753,900.	85,100.
WESTWOOD	A	357,800.	673,700.	787,500.	730,700.	805,800.	85,800.
	B	290,100.	558,900.	649,300.	605,600.	665,000.	84,100.

TABLE 4-17

STRUCTURAL ALTERNATIVES - OPERATIONS & MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
CANTON	C	29,200.	21,900.	25,500.	29,400.	47,800.	1,400.
MILTON	B	23,900.	21,200.	24,600.	23,500.	46,800.	1,300.
	C	21,800.	17,700.	20,000.	19,300.	42,500.	700.
	D	22,600.	18,800.	21,500.	20,600.	43,900.	900.
NORWOOD	A	25,200.	24,000.	78,200.	26,900.	50,300.	1,700.
	B	27,600.	79,800.	35,300.	33,400.	56,900.	2,600.
	C	23,000.	19,600.	22,600.	21,700.	45,000.	1,000.
	D	23,500.	20,400.	23,600.	22,600.	45,900.	1,200.
	E	22,400.	18,000.	21,200.	30,400.	43,700.	900.
	I	33,000.	49,200.	58,900.	54,900.	78,700.	5,100.
SHARON	E	23,900.	21,300.	24,800.	23,700.	47,100.	1,300. ⁴
	F	22,900.	19,400.	22,300.	21,500.	44,700.	1,000. ³
STOUGHTON	B	30,600.	38,800.	46,300.	43,500.	67,200.	3,800.
	C	23,900.	21,300.	24,800.	23,700.	47,100.	1,300.
WALPOLE	B	26,300.	26,600.	31,300.	29,800.	53,200.	2,100.
	I	23,600.	26,700.	23,900.	22,900.	46,200.	1,200.
	J	25,400.	24,400.	28,700.	27,300.	50,700.	1,800.
WESTWOOD	A	25,800.	25,300.	29,700.	28,300.	51,700.	1,900.
	B	24,800.	23,000.	26,900.	25,700.	49,000.	1,600.

TABLE 4-18
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
ASHLAND	G	173,500.	352,900.	404,500.	381,600.	414,800.	81,600.
	J	197,400.	395,000.	455,400.	428,500.	467,000.	82,100.
FRAMINGHAM	A	579,700.	1,035,100.	1,228,700.	1,129,500.	1,253,000.	91,700.
	C	326,400.	620,800.	723,700.	673,000.	740,800.	85,000.
	G	678,300.	119,000.	1,420,000.	1,293,000.	1,446,200.	94,600.
	H	503,300.	913,000.	1,078,000.	991,400.	1,101,200.	89,600.
	I	407,300.	756,300.	887,500.	820,500.	902,400.	87,000.
	J	549,100.	986,500.	1,168,700.	1,071,400.	1,192,400.	90,800.
	K	974,700.	1,640,500.	1,984,000.	1,785,000.	2,012,000.	104,000.
	L	230,000.	454,000.	524,200.	491,500.	537,300.	82,800.
	M	150,200.	310,000.	354,100.	335,000.	363,200.	81,100.
	N	241,700.	474,700.	548,800.	514,000.	362,000.	83,000.
	O	353,700.	666,900.	779,200.	723,200.	797,100.	85,700.
	P	355,800.	670,300.	783,400.	726,900.	801,600.	85,700.
MAYNARD	E	482,300.	878,900.	1,036,900.	954,200.	1,059,000.	89,000.
	G	121,200.	255,800.	290,800.	276,100.	298,200.	80,600.
	I	71,500.	159,000.	178,800.	171,300.	183,300.	79,700.

TABLE 4-19
STRUCTURAL ALTERNATIVES - OPERATION AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
ASHLAND	G	22,800.	19,300.	22,100.	21,300.	44,500.	1,000.
	J	23,200.	20,000.	23,100.	22,200.	45,400.	1,100.
FRAMINGHAM	A	28,800.	33,200.	39,500.	37,300.	60,900.	3,100.
	C	25,300.	24,200.	28,400.	27,100.	50,500.	1,800.
	G	30,000.	37,000.	44,100.	41,500.	65,100.	3,600.
	H	27,800.	30,400.	36,100.	34,100.	57,600.	2,700.
	I	26,500.	27,000.	31,900.	30,300.	53,700.	2,200.
	J	28,400.	32,100.	38,100.	36,000.	59,600.	2,900.
	K	33,600.	49,100.	58,700.	54,800.	78,500.	5,100.
	L	23,800.	21,000.	24,400.	23,400.	46,700.	1,300.
	M	22,400.	18,500.	21,200.	20,400.	43,600.	900.
	N	24,000.	21,400.	24,900.	23,800.	47,200.	1,300.
	O	25,700.	25,100.	29,600.	28,100.	51,600.	1,900.
	P	25,700.	25,200.	29,600.	28,200.	51,600.	1,900.
MAYNARD	E	27,500.	29,600.	35,100.	33,300.	56,800.	2,600.
	G	21,800.	17,700.	20,000.	19,300.	42,500.	700.
	I	20,700.	16,100.	12,900.	17,400.	40,500.	400.

TABLE 4-20
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
BURLINGTON	A	240,500.	472,600.	546,300.	511,700.	559,900.	83,000.
	F	321,100.	611,900.	712,900.	663,300.	729,900.	84,900.
	K	293,500.	564,600.	656,200.	611,900.	672,000.	84,200.
	L	187,800.	378,700.	434,900.	409,600.	446,000.	81,900.
	M	250,200.	489,600.	566,500.	530,200.	580,500.	83,200.
	T	417,600.	773,200.	908,100.	839,000.	928,300.	87,300.
	U	236,800.	466,100.	538,500.	504,600.	551,900.	82,900.
	Z	177,100.	359,400.	412,200.	388,700.	422,700.	81,700.
NORTH READING	H	74,900.	166,000.	186,800.	178,800.	191,500.	79,800.
	I	69,100.	154,400.	173,500.	166,200.	177,800.	79,700.
	J	79,500.	175,000.	197,200.	188,600.	202,200.	79,900.
	K	81,600.	179,200.	202,100.	193,200.	207,200.	79,900.
	L	33,900.	81,300.	90,200.	87,200.	92,300.	79,200.
	M	51,100.	117,600.	131,400.	126,500.	134,600.	79,400.
	N	113,300.	240,700.	273,200.	259,700.	280,200.	80,400.
							4-35
READING	A	412,500.	764,800.	897,800.	829,800.	917,900.	87,100.
	B	86,900.	189,700.	214,100.	204,500.	219,600.	80,000.
	C	299,600.	525,000.	668,700.	623,200.	684,800.	84,300.
	D	89,000.	193,200.	218,800.	208,800.	224,300.	80,000.
	E	174,300.	354,300.	406,100.	383,100.	416,500.	81,600.
	F	201,500.	403,300.	464,000.	436,400.	475,800.	82,200.
	G	210,700.	419,900.	483,700.	454,500.	495,900.	82,400.
	H	121,200.	255,800.	290,800.	276,100.	298,200.	80,600.
	I	86,000.	187,800.	212,000.	202,400.	217,300.	80,000.
	J	174,900.	355,500.	407,500.	384,400.	418,000.	81,600.
	K	190,500.	383,600.	440,700.	415,000.	415,000.	81,900.

TABLE 4-21
STRUCTURAL ALTERNATIVES - OPERATIONS AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
BURLINGTON	A	24,000.	21,400.	24,800.	23,800.	47,100.	1,300.
	F	25,200.	24,000.	28,200.	26,900.	50,300.	1,700.
	K	24,800.	23,100.	27,200.	25,800.	49,200.	1,600.
	L	23,100.	19,700.	22,700.	21,800.	45,100.	1,100.
	M	24,100.	21,700.	25,200.	24,200.	47,500.	1,400.
	T	26,600.	27,300.	32,300.	30,700.	54,100.	2,200.
	U	23,900.	21,300.	24,700.	23,600.	47,000.	1,300.
	Z	22,900.	19,400.	22,300.	21,400.	44,700.	1,000.
NORTH READING	H	20,800.	16,300.	18,000.	17,500.	40,600.	500.
	I	20,700.	16,100.	17,800.	17,300.	40,400.	400.
	J	20,900.	16,400.	18,200.	17,700.	40,800.	500.
	K	21,000.	16,500.	18,300.	17,800.	40,900.	500.
	L	19,700.	15,000.	16,100.	15,800.	38,800.	200.
	M	20,200.	15,500.	17,000.	16,500.	39,600.	300.
	N	21,700.	17,400.	19,600.	19,000.	42,200.	700.
READING	A	26,500.	27,200.	32,100.	30,500.	53,900.	2,200.
	B	21,100.	16,600.	18,500.	18,000.	41,100.	500.
	C	24,900.	23,300.	27,300.	26,000.	49,400.	1,600.
	D	21,100.	16,700.	18,600.	18,100.	41,200.	500.
	E	22,800.	19,300.	22,100.	21,300.	44,600.	1,000.
	F	23,300.	20,100.	23,200.	22,300.	45,600.	1,100.
	G	23,500.	20,400.	23,600.	22,700.	46,000.	1,200.
	H	21,800.	17,700.	20,000.	19,300.	42,500.	700.
	I	21,100.	16,600.	14,500.	17,900.	41,100.	500.
	J	22,900.	19,300.	22,200.	21,300.	44,600.	1,000.
	K	23,100.	19,800.	22,800.	21,900.	45,200.	1,100.

TABLE 4-22
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
BEVERLY	B	1,033,100.	1,727,100.	2,093,500.	1,879,500.	2,121,700	106,000.
	C	222,300.	440,500.	508,200.	476,900.	520,900.	82,600.
	D	390,900.	739,000.	866,500.	801,700.	886,100.	86,700.
LYNN	A	370,200.	694,600.	812,700.	753,400.	831,400.	86,100.
	B	384,900.	719,000.	842,300.	780,000.	861,500.	86,400.
	H	COMBINED SEWER SYSTEM					
	I	693,000.	1,212,800.	1,448,400.	1,318,300.	1,474,700.	95,000.
	J	COMBINED SEWER SYSTEM					
MARBLEHEAD	K	COMBINED SEWER SYSTEM					
	A	746,800.	1,295,900.	1,551,800.	1,409,000.	1,578,800.	96,700.
	B	324,300.	617,300.	719,400.	669,200.	736,500.	84,900.
SALEM	C	707,500.	1,235,400.	1,476,400.	1,342,900.	1,502,900.	95,500. ⁴
	I	189,900.	382,500.	439,400.	413,700.	450,500.	81,900.
	J	173,500.	352,900.	404,500.	381,600.	414,800.	81,600.
	K	302,300.	579,700.	674,300.	628,200.	690,500.	84,400.
	L	169,100.	344,900.	395,100.	372,900.	405,200.	81,500.
	M	89,000.	193,700.	218,800.	208,800.	224,300.	80,000.
	N	147,800.	305,600.	349,000.	330,300.	358,000.	81,100.
	O	236,200.	465,100.	537,300.	503,600.	550,700.	82,900.
	A	COMBINED SEWER SYSTEM					
	C	298,500.	573,200.	666,500.	621,200.	682,500.	84,300.
SWAMPSCOTT	D	585,700.	1,044,600.	1,240,300.	1,134,800.	1,264,700.	91,900.
	C	1,194,500.	1,963,300.	2,393,600.	2,137,500.	2,421,000.	111,600.
WAKEFIELD	D	220,400.	437,100.	504,100.	473,100.	516,800.	82,600.
	E	358,800.	675,400.	789,500.	732,500.	807,800.	85,800.
	F	511,400.	926,000.	1,094,500.	1,005,500.	1,117,300.	89,800.

4-37

TABLE 4-23

STRUCTURAL ALTERNATIVES - OPERATION AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTION
BEVERLY	B	34,300.	51,600.	61,700.	57,500.	81,300.	5,300.
	C	23,700.	20,800.	24,100.	23,100.	46,400.	1,200.
	D	26,300.	26,600.	31,400.	29,800.	53,300.	2,100.
LYNN	A	25,900.	25,700.	30,300.	28,800.	52,200.	2,000.
	B	26,200.	26,200.	30,900.	29,400.	52,800.	2,100.
	H	COMBINED SEWER SYSTEM					
	I	30,200.	37,600.	44,800.	42,100.	65,700.	3,600.
	J	COMBINED SEWER SYSTEM					
MARBLEHEAD	K	COMBINED SEWER SYSTEM					
	A	30,900.	39,700.	47,400.	44,500.	68,100.	3,900.
	B	25,300.	24,100.	28,300.	27,000.	50,400.	1,800.
SALEM	C	30,400.	38,100.	45,500.	42,700.	66,400.	3,700.
	I	23,100.	19,800.	22,800.	21,900.	45,200.	1,100.
	J	22,800.	19,300.	22,100.	21,300.	44,500.	1,000.
	K	24,900.	23,400.	27,400.	26,100.	49,500.	1,700.
	L	22,700.	19,100.	21,900.	21,100.	44,400.	1,000.
	M	21,100.	16,700.	18,600.	18,100.	41,200.	500.
	N	22,400.	18,500.	21,100.	20,300.	43,500.	800.
	O	23,900.	21,200.	29,700.	23,600.	46,900.	1,300.
							4-38
SWAMPSCOTT	A	COMBINED SEWER SYSTEM					
	C	24,900.	23,300.	27,200.	26,000.	49,400.	1,600.
	D	28,900.	33,500.	39,800.	37,500.	61,100.	3,100.
WAKEFIELD	C	36,100.	58,700.	70,200.	65,300.	86,100.	6,100.
	D	23,600.	20,700.	24,000.	23,000.	46,300.	1,200.
	E	25,800.	25,300.	29,800.	28,300.	51,800.	1,900.
	F	22,900.	20,700.	36,400.	34,500.	58,000.	2,700.

TABLE 4-24
STRUCTURAL ALTERNATIVES - CAPITAL COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DI. SOLVED AIR FLOTATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
NORTH-SOUTH BASIN							
SCITUATE	H	381,900.	714,200.	836,400.	774,700.	855,500.	86,400.
NORWELL	E	161,700.	331,300.	379,100.	358,100.	388,800.	81,400.
	G	307,800.	589,100.	685,500.	638,400.	701,900.	84,500.
ROCKLAND	B	505,400.	916,400.	1,082,800.	995,100.	1,105,500.	89,600.
	C	183,500.	371,100.	425,900.	401,300.	436,800.	81,800.
	E	352,700.	665,200.	777,200.	721,400.	795,300.	85,600.
	H	266,200.	517,500.	599,800.	560,600.	614,500.	83,600.
	J	262,800.	511,400.	592,500.	553,900.	607,100.	83,500.
	K	291,800.	561,700.	652,800.	608,700.	668,500.	84,200.
WEYMOUTH BASIN							
HINGHAM	C	137,400.	286,200.	326,300.	309,200.	334,700.	80,900.
	D	693,000.	1,212,800.	1,448,400.	1,318,300.	1,474,700.	95,000.
	E	385,400.	719,900.	843,300.	780,900.	862,400.	86,400.
RANDOLPH	B	407,800.	757,100.	888,400.	821,400.	908,400.	87,000.
WEYMOUTH	B	260,300.	507,200.	587,600.	549,400.	602,000.	83,400.
	C	391,100.	729,400.	854,900.	791,300.	874,300.	86,600.
	D	413,500.	766,400.	899,800.	831,600.	919,900.	87,200.
	E	498,700.	905,500.	1,069,400.	983,100.	1,093,900.	89,400.
	F	235,600.	464,000.	536,000.	502,300.	549,300.	92,900.
	G	331,100.	628,800.	733,300.	681,300.	750,600.	85,100.
	H	417,600.	773,200.	908,100.	839,000.	928,300.	87,300.
	I	428,200.	790,800.	929,400.	858,200.	950,000.	87,500.
	L	319,000.	608,200.	708,500.	659,300.	725,400.	84,800.
	M	472,700.	863,400.	1,017,900.	937,300.	1,039,800.	88,700.

TABLE 4-25
STRUCTURAL ALTERNATIVES - OPERATION AND MAINTENANCE COSTS

COMMUNITY	SYSTEM CODE	SWIRL CONCENTRATOR	SEDIMENTATION	DISSOLVED AIR FLOATATION	FLOCCULATION SEDIMENTATION	FILTRATION	DISINFECTIONS
NORTH-SOUTH BASIN							
SCITUATE	H	26,100.	26,100.	30,800.	29,200.	52,700.	2,100.
NORWELL	E	22,600.	18,900.	21,600.	20,800.	44,100.	900.
	G	25,000.	23,600.	27,600.	26,400.	49,700.	1,700.
ROCKLAND	B	27,800.	30,500.	36,200.	34,200.	56,800.	2,700.
	C	23,000.	19,000.	22,500.	21,600.	44,900.	1,000.
	E	25,700.	25,100.	29,500.	28,100.	51,500.	1,900.
	H	24,400.	22,200.	25,900.	24,800.	48,100.	1,500.
	J	24,300.	22,100.	25,800.	24,600.	48,000.	1,400.
	K	24,800.	23,100.	27,000.	25,700.	49,100.	1,000.
WEYMOUTH BASIN							
HINGHAM	C	22,200.	18,200.	20,000.	19,900.	43,100.	800.
	D	30,200.	37,000.	44,800.	42,100.	65,700.	3,600.
	E	26,200.	26,200.	30,900.	29,400.	52,800.	2,100.
RANDOLPH	B	26,500.	27,000.	31,900.	30,300.	53,700.	2,200.
WEYMOUTH	B	24,300.	22,000.	25,700.	24,500.	47,900.	1,400.
	C	26,200.	26,400.	31,700.	29,600.	53,100.	2,100.
	D	26,600.	27,200.	32,100.	30,500.	54,000.	2,200.
	E	27,700.	30,200.	35,900.	33,900.	57,400.	2,700.
	F	23,900.	21,200.	24,600.	23,600.	46,900.	1,300.
	G	25,400.	24,800.	28,000.	27,300.	50,700.	1,800.
	H	26,600.	27,300.	32,300.	30,700.	54,100.	2,200.
	I	26,800.	27,700.	32,800.	31,100.	54,600.	2,300.
	L	25,200.	24,000.	28,100.	26,800.	50,200.	1,700.
	M	27,400.	29,300.	34,700.	32,900.	56,400.	2,500.

III MANAGEMENT AGENCIES FOR STORMWATER

The staff has identified four levels of management responsibility for the control of stormwater runoff. They are the federal government (Environmental Protection Agency, HUD, Corps of Engineers, Soil Conservation Service); the State of Massachusetts (Department of Environmental Quality Engineering, Division of Water Pollution Control, Division of Waterways, Division of Land and Water Use, Department of Public Works); Regional Planning Agency (MAPC, MDC, other regional districts) and each of the 92 communities included in this study area. The level of responsibility assigned to each level of government is discussed in Section 6. Community-specific recommendations on Best Management Practices and other actions are listed alphabetically within the major river basin in which they are found in Part I.

In addition to the community-specific recommendations contained in Part II, of the Draft Areawide Plan, the following general recommendations are set forth as policy guidelines for communities which fall within one of the three subregional designations as either an urban, suburban or rural community.

- 1) Urban Communities - Major emphasis should be on the control and/or elimination of all combined sewer overflows. Emphasis for stormwater controls should be on Best Management Practices. At the same time, evaluations should be undertaken to identify the need for some optimum consideration of structural and non-structural controls (with the assistance of MAPC, DWPC and EPA).
- 2) Suburban Communities - Major emphasis should be on the development and implementation of Best Management Practices. Emphasis should be placed on minimizing potential future stormwater problems which will accompany new development. In this regard, regulations requiring site plan review, water quality considerations, in addition to flooding considerations in drainage design regulations, regulations requiring developers to demonstrate that maximum use of natural drainage characteristics is included in site design and requirements that control measures are applied during construction activities (and that certain of these controls are retained in use after construction where appropriate, e.g., sedimentation basins, stream bank vegetation, etc.) should be developed and implemented (with MAPC technical assistance).
- 3) Rural Communities - Major emphasis should be on developing and requiring implementation of preventive measures using the same regulatory guidelines as for suburban communities. Best Management Practices should be applied where necessary or where otherwise recommended in this plan. Stream protection and conservation should be of high priority (with MAPC technical assistance).

Funding. Under PL 92-500, facilities construction to control stormwater pollution was eligible for federal funding through Section 201. Stormwater facilities were not funded in Massachusetts under PL 92-500, however, because the need for sanitary sewers and wastewater treatment facilities was considered to be a higher priority.

In the 1977 revisions to PL 92-500 the United States Congress eliminated all funding for structural solutions for stormwater discharges up to 1981. This move reflects recognition by EPA and Congress that more work needs to be done on the relationship between stormwater runoff and impacts on the quality of the receiving waters before decisions can be made to commit large sums of money to structural solutions. The change also requires attention to the development and implementation of the "Best Management Practices" presented in this section and in the separate "Stormwater Report".

The cost of the solutions discussed in both products, capital and operation/maintenance must be borne by local government and by those state (i.e., MDPW, MDC) agencies with direct control over streets, stormwater facilities and related regulatory programs. It should be emphasized that the operation and maintenance costs presented in the following charts may not be totally in addition to current operation and maintenance costs. This is because many communities are already performing O&M functions for other purposes, such as public health, system efficiency and visual appearance. In such cases, the real cost to a community is the cost of focusing or increasing its efforts to achieve maximum water quality benefits. The MAPC, if funding is received from EPA for implementation technical assistance, will be able to aid member communities in evaluating and focusing O&M programs and other "Best Management Practices" to obtain the greatest value in water quality terms for the least cost and to explore alternative funding mechanisms which will minimize the impact on property taxes.



Section 2.5

Non-point Pollution

PART II, SECTION 5 NON-POINT SOURCE POLLUTION

In this section you will find:

- I. A discussion of land development controls which can prevent and/or control non-point pollution, including;
 - A. Wetlands Zoning District
 - B. Floodplain Zoning District
 - C. Aquifer Protection District
 - D. Watershed Zoning District or Buffers
 - E. Water Resource Protection District
 - F. Grading and Slope Regulations
 - G. Minimum Open Space Requirements
 - H. Parking Area Regulations
 - I. Land Use and Density Regulations
 - J. Cluster and PUD Regulations
 - K. Site Plan Review
 - L. Subdivision Control
 - M. Performance Standards
 - N. Growth Management
 - O. Transfer of Development Rights
 - P. Acquisition of Land
 - Q. Conservation Districts
 - R. Wetlands Protection

- II. A discussion of water conservation and its relationship to water quality, including:
 - A. The Benefits
 - B. A Sample Conservation Program
 - C. Some Additional Techniques in State and Local Regulation

- III. An examination of on-site sewage disposal, including:
 - A. Operation and Location
 - B. Regulations
 - C. Sample Inspection/Maintenance Programs

- IV. An examination of landfills and water quality, including:
 - A. Siting
 - B. Operation
 - C. Monitoring
 - D. Regional Options for the Future

- V. A discussion of road de-icing salt and water quality, including:
 - A. The Problem
 - B. New State Regulations
 - C. A Local Salt Control Program

Attached to this section are two lists of material which may be of assistance to local communities in the implementation of the 208 recommendations: (a) a list of available maps produced by the MAPC 208 program, and (b) a list of sample and model ordinances, by-laws and other regulations.

The three concepts discussed in Part II Section 2 are directed at the treatment of wastewater, and while this represents an important part of the management of water quality, it is not the whole story. This section discusses non-point water quality problems and their solutions. These should not be viewed as alternatives to the treatment concepts in Part II Section 2, but rather as an integral part of any program for wastewater management. The non-point problems must be addressed simultaneously with the point source problems to insure that a fully comprehensive plan is developed and to prevent piecemeal solutions to only part of the problems of water quality. In Part I, Section 2 of this report, means of controlling and preventing non-point pollution from this section will be matched with the wastewater treatment recommendations to provide the basis for a comprehensive management program for each city and town.

I. LAND DEVELOPMENT CONTROLS

Land development controls are a useful tool for the management of water quality. Often, careful planning can be an effective means of prevention of water quality problems, and water quality implications should be considered before a community undertakes its land development regulation.

Community planning, as the basis of land development regulation should include, as one of its considerations, the natural capacity of the land to support development. Certainly not all areas of land are environmentally similar and therefore can not sustain the same type or intensity of development. While the installation of sewers by a community can alter to some degree an area's environmental capability for development, certain natural limitations still should be important considerations. While looking at the limitations or development inherent in some of the non-structural solutions, a community should also review its regulation of land which is environmentally capable of supporting development. This will enable the community to achieve its environmental goals without unnecessarily excluding needed housing and economic development in the process.

This project examined a variety of environmental characteristics in analyzing the capacity of certain areas for development. A composite mapping of these natural features is called the Environmental Pattern and includes waterbodies, wellfields and lands adjacent to reservoirs, aquifer recharge areas, flood hazard areas, areas of steep slope, areas of severe soil limitations for on-site sewage disposal. This rationale of environmental limitations, both with and without public services, was used in developing some of the recommendations in this plan.

The recommendations are mapped at a scale of 1" = 3,000', a scale not immediately applicable to local government land use maps. This scale was necessary for two major reasons: (1) the planning area covers some 1,200 square miles of land in 92 communities, and (2) the determination of specific land use controls in each community will involve the exercise of home rule authority and consideration of local goals for growth, open space, housing, sewerage, taxes, community character and other factors along with the water quality goals. This means that local officials on most boards or departments must be involved in adopting these measures as city or town regulations at a local scale.

As communities begin the implementation of the non-structural solutions, MAPC will work with the communities and make available the extensive natural resource mapping included in this project. It is understood that continued assistance will be appropriate as specific application of the land development controls recommended are studied further. The 208 maps, which are available for community use and which can provide more detailed information than the generalized areas indicated in the recommendations, are listed at the end of this section.

MAPC has been developing and reviewing a variety of local regulations for water quality. Several of these were presented in an appendix to the 208 Management Alternatives Report, and work continues on the development of additional regulations specifically oriented to water quality problems. At the end of this section, there is a list of the types of regulations for which MAPC has samples or models. Not all of these have yet been adapted to accomplish specific water quality goals.

Land use controls can be helpful in addressing the problems of subsurface disposal, stormwater runoff, and erosion and sedimentation, and often a particular land use regulation can be helpful in minimizing more than one water quality problem. Outlined below are some of these land use controls and each control can be used to address potential water quality problems.

Zoning is probably the most well-known and widely used land development control at the local level. The regulations discussed here are arranged into three types of zoning regulations.

- 1) Natural feature zoning districts which are related to particular geographic areas having direct relationship to the protection and maintenance of water quality, such as wetlands, floodplains, aquifers, watersheds, etc.
- 2) The arrangement of land use and density regulations, as well as clustered development practices, as they relate to water quality.
- 3) Development regulations used at the site level for insuring that development is situated on the land in a way which will minimize negative water quality impacts.

Chapter 808 of the Acts of 1975 amended Chapter 40A of the General Laws, the Zoning Act. While the new act does not attempt to limit the purposes of zoning, it does suggest objectives for which zoning could be established. These include the conservation of health; securing safety from flood and other dangers; the prevention of the overcrowding of land to avoid undue concentration of population; facilitating the adequate provision of water supply, drainage, sewerage, open space and other public requirements; the conservation of natural resources and the prevention of blight and pollution of the environment; and the encouragement of the most appropriate use of land, including consideration of the recommendations of the master plan, if any, of the regional planning agency.

In light of these expanded objectives, the establishment of zoning districts for the protection of wetland, floodplain, aquifer recharge areas, stream buffers and districts for watershed protection and water resource protection should be considered a legitimate use of the zoning power. While care must be taken in the drafting of such by-laws to prevent privately-owned land from being deprived of all practical values, ordinances can be drafted which consider the natural characteristics of the land (drainage and recharge, for example), and the effect which different types of development have on this natural character. Such ordinances may require increased technical expertise in their drafting and their administration, particularly when a more detailed data base is required.

Chapter 808 specifically authorizes cluster and PUD provisions through the issuance of special permits. It also authorizes increases in density or intensity of use where the developer agrees to conditions which benefit the community, and allows the special permit granting authority to adopt rules prescribing "the size, form, contents, style and number of copies of plans and specifications and the procedures for the submission and approval of such permits."

A. Wetlands Zoning District

The basic purpose of a wetlands protection district is to ensure that the critical natural functions of wetlands are maintained. These functions include water supply, flood control, entrapment of sediments and other pollutants and protection of wetlands vegetation and wildlife habitat.

Any development activity which necessitates extensive site modification should be prohibited in delineating wetland areas. Filling, dumping, dredging, paving, construction of structures or sewage disposal systems, and storage of salt, petroleum products, chemicals and similar substances would not be permitted. Permitted uses might be activities related to hunting and fishing, types of agriculture not requiring intensive fertilizers or pesticides, and certain other limited conservation or recreation uses.

B. Floodplain Zoning District

A floodplain protection district has a twofold purpose:

- 1) to provide public safety protection by affording natural storage areas for floodwaters and thus serving to prevent property damage;
- 2) to prevent possible water quality problems resulting from greater volumes and velocity of stream flow, greater sediment yields, and contamination from urban runoff and sewage disposal systems.

As in wetlands zoning, any development activity which necessitates extensive site modification should be prohibited in delineated floodplains. Conservation, recreation and agricultural activities which do not degrade water quality or hinder the floodway could be permitted in some areas of the floodplain district. Structures such as backstops necessary for outdoor games, duck blinds and the like are compatible uses. The use of fertilizers

and pesticides for golf courses or tilled cropland would have to be carefully regulated, as would all impermeable surfaces. Changes in natural contours and vegetative cover should be kept to an absolute minimum.

C. Aquifer Protection District

The basic purposes of an aquifer recharge protection district are to assure that underground water supplies are recharged by the infiltration of precipitation and to safeguard groundwater from contamination.

The amount of impervious surface in a recharge area is of primary importance for maintaining infiltration and should be regulated. Minimum lot sizes to prevent the crowding of subsurface sewage disposal systems are necessary to avoid potential degradation of water quality. Storage and use of potential contaminants such as petroleum products and de-icing salts should be carefully regulated, if permitted, and sanitary landfills should not be permitted in aquifer recharge areas. Since drainage is of particular concern, special requirements for porous pavement or gravel driveways, open watercourses, recharge basins, and dry wells can be part of an aquifer recharge district in order to promote maximum infiltration and minimum runoff.

The practice of clustering development should be encouraged in an aquifer protection district, so that on-site wastewater disposal systems can be carefully located to offer the least potential contamination to the groundwater and so that the total amount of impervious surface is reduced. Where sewage disposal facilities other than subsurface systems are available, cluster provisions could permit higher residential densities. If the development is to be served by subsurface systems or a communal system, cluster provisions could also be used to control their location to protect the aquifer.

In considering possible development in an aquifer recharge area, the local authority should evaluate the immediate and long-range impact of the proposed use on the groundwater and the possible effects of the proposed use upon the maintenance of safe and healthful conditions. In making such evaluation, the local authority shall consider such factors as:

- 1) The amount and type of wastes to be generated by the proposed use and the adequacy of the proposed disposal system.
- 2) The capability of the land and water to sustain such use without degradation.
- 3) Topography and drainage of the site and susceptibility to flooding.
- 4) The need of a particular location for the proposed use.
- 5) The compatibility of the proposed use with adjacent land-uses.

In approving an application in an aquifer area, governments may impose such reasonable restriction concerning the setback of the structure from an aquifer or recharge area, the quantity of potential pollutants to be permitted within the aquifer protection area, and like matters, as it deems advisable in order to protect the quality of the groundwater.

D. Watershed Zoning District or Buffers

The purpose of buffer areas along streams and around lakes and ponds is to preserve and protect the filtration and purification function of land bordering watercourses and waterbodies, which minimizes the potential for erosion and sedimentation problems and traps pollutants included in run-off. Similarly, the basic purpose of a watershed protection district is to protect reservoirs, lakes and ponds from contamination from run-off and erosion regulating development in the immediate watershed of such waterbodies.

The regulatory mechanism to protect the environmental area adjacent to waterbodies and streams could be either a zoning district delineating the particular areas included as the buffers, or a definition could establish a specific setback from streams and waterbodies. For the purpose of maintaining water quality on the watershed or buffer areas, pollutants that might result from urban runoff, such as the use of fertilizers and pesticides, and the use of salt for snow removal, would be regulated. The removal of vegetative cover and slope alteration, and the use of impervious surfaces, would also be regulated so that they would not degrade water quality. Construction activities in this area would be regulated in such a manner that erosion and sedimentation would be minimized. If on-site disposal systems were permitted within any of the buffer areas, their density and location would be regulated to minimize any concentration of nutrients which would contribute to the eutrophication process.

E. Water Resource Protection District

Wetlands, floodplains, aquifer recharge areas, buffers and watersheds could be included in a comprehensive water resource protection district (in contrast to a separate district for each natural feature area). The purpose of such a comprehensive zoning district would be to protect the system of surface and groundwater from adverse water quality impacts in a rational comprehensive and coordinated manner. This comprehensive approach to water quality protection involves delineation of all natural features requiring protection and could avoid overlapping regulations which might occur when using separate districts.

Within a comprehensive water resources protection district, the permitted uses would follow the same criteria previously described in the various environmental areas and would be regulated similarly to the separate districts.

Specific portions of a community's zoning regulations should be oriented to the possible effects of development on water quality. Grading and slope regulations, minimum open space requirements, and parking regulations are all important in the protection of water quality. These three regulations can be included in the zoning regulations in any of three forms. They can be written to apply to a specific type of land use activity on a community-wide basis; or to apply to specific permitted uses in designated districts; or to apply to any land development in a particular environmentally sensitive area, for example an aquifer recharge area.

F. Grading and Slope Regulations

The grading and slope regulations regulate runoff and erosion from any given site; maximize infiltration into the ground; and more generally, protect the quality of surface and groundwater.

Grading and slope standards can be written to apply to development on all land over a specified slope, or they can be drafted to apply to all land development within a specified area, such as a watershed protection district. The standards define maximum finished slopes and grades, and specify land management practices during and after construction in order to reduce water runoff and soil erosion. Standards for the maintenance and restoration of vegetative cover could for example be included in such regulations. The use of artificial, impervious or steep slopes could also be regulated through the use of grading and slope regulations.

Standards could be established which regulated the percentage of land to remain in vegetation, like that shown below.

Hillside areas shall be retained with vegetative cover as follows:

Average percentage slope	Minimum percentage of land to remain in vegetation
10.0 - 14.9	25
15.0 - 19.9	40
20.0 - 24.9	55
25.0 - 29.9	70
30.0 and above	85

G. Minimum Open Space Requirements

Open space requirements currently used often relate to the maximum building coverage permitted on individual lots and, in a limited number of cases, minimum open space requirements are used in conjunction with coverage regulations. These open space requirements could be used to preserve natural drainage patterns and to protect the recharge function over high yield aquifers by the retention of land in its natural state. The amount of impervious area is the key measurement in the open space regulation, with only those areas that permit natural drainage and recharge considered as open space. This does differ from building coverage requirements which are more oriented to the adequate provision of light and air and which do not regulate the extent of driveways and parking areas.

H. Parking Area Regulations

Parking regulations are currently contained in most zoning regulations for off-street parking requirements, although these generally regulate only the amount of parking area. From a water quality perspective, such requirements should be expanded or modified to include regulations on natural drainage and infiltration for the purpose of reducing stormwater runoff and protecting water quality.

Parking area regulations could address quantity of impervious surface, on-site drainage of impervious surfaces, and maintenance of the process of infiltration. Requirements for maintenance of natural vegetative cover or for planting of new vegetation around all parking areas could also be included, as well as the encouragement of using porous pavements or gravel surfaces, where appropriate.

I. Land Use and Density Regulations

Zoning normally regulates the use and density of land development and the establishment of minimum lot sizes is a common technique to determine development density. Most commonly, minimum lot sizes are associated with residential land uses, although these minimums can also be used with commercial and industrial land uses.

In order to establish densities of development that will not have adverse impacts on water quality, the natural capacity of the soil, considering the type of waste disposal facilities to be used, should form the basis for minimum lot requirement. For example, in the case of residential development using individual on-lot subsurface disposal, the lot size appropriate for such development should be determined by the permeability of various soil types, the area necessary for alternate leaching fields, the slope of the land, the proximity to surface or groundwater, etc. It should also be considered that the development is using an on-lot well, the distance and location between the well site and the waste disposal facility must also be taken into account in determining the minimum lot size. By siting on-lot systems in those areas which are naturally well-suited to their use, then a major step has been taken to enhance their effective functioning as waste disposal facilities.

J. Cluster and PUD Regulations

In addition to the minimum lot size required, a community can utilize a cluster or planned-unit development (PUD) approach to regulate on-site disposal systems. Cluster development regulation is more flexible than traditional zoning in that it permits developers of relatively large sites to deal with the entire site as a unit rather than dealing with a number of separate lots. The overall density of the development remains constant in a cluster development, but the internal distribution of the units is altered.

Unlike a traditional form of development which uses a standardized grid-pattern development, the cluster technique allows the units to be clustered together, while a significant portion of the land remains undeveloped. Therefore, environmentally sensitive areas including steep slopes, outcrops of bedrock, or wetlands remain as undeveloped open space, thus protecting water quality. At the same time, the more permeable soils could serve the on-site disposal systems. An additional water quality aspect is that the total length of access roads and driveways tends to be shorter under cluster development, and therefore the amount of impervious surface is decreased and runoff problems are reduced.

K. Site Plan Review

Site plan review is a planning and design technique whereby land developments may be evaluated and special permits may be granted. This technique is utilized by many communities to allow a more detailed review of the siting of particular land uses which exhibit potential for requiring additional municipal services. This type of review often focuses on vehicular parking and loading requirements as well as the provision of screening and visual buffers. A logical additional application would involve carrying its use beyond visual and traffic safety purposes to protect water quality, with the effects of impervious surface on drainage and recharge.

The site plan review requirement could be written to apply either to particular land uses or to a specific geographic area. For example, the regulation could either stipulate the specific types of land uses which have a significant potential water quality impact and require a site plan review, or the regulation could be such that all development which occurred in a specific environmentally sensitive area would require a site plan review.

The information to be supplied with a site plan is important from a water quality standpoint. In many respects, the natural feature data regarding the site, along with construction plans and specifications, should be similar to the information available for subdivision review

Besides providing the data concerning the natural features of the site, the site plan review process should include an erosion and sedimentation control plan for the construction phase of the work and also as a permanent aspect of the development.

Standards for the review of site plans could be established in the local bylaw, as in the following example:

No grading or construction shall take place on slopes in excess of 25% except under Special Permit from the Board of Appeals, which shall be granted only upon demonstration that adequate provisions have been made to protect against erosion, soil instability, uncontrolled surface water runoff, or other environmental degradation.

All slopes exceeding 15% resulting from site grading shall either be covered with topsoil to a depth of 4" and planted with vegetative cover sufficient to prevent erosion or be retained by a wall constructed of masonry, reinforced concrete, piles or timber.

No area or areas totalling 2 acres or more on any parcel or contiguous parcels in the same ownership shall have existing vegetation clear-stripped or be filled 6" or more such as to destroy existing vegetation unless in conjunction with agricultural activity, or unless necessarily incidental to construction on the premises under a currently valid building permit, or unless within streets which are either public or designated on an approved subdivision plan, or unless a Special Permit is approved by the Board of Appeals on condition that runoff will be controlled, erosion avoided, and either a constructed surface or cover vegetation will be provided not later than the first full spring season immediately following completion of the stripping operation. No stripped area or areas which are allowed by special permit shall remain through the winter without a temporary cover of winter rye or similar plant material being provided for soil control, except in the case of agricultural activity where such temporary cover would be infeasible.

Similarly, measures could be required for any development, whether it is a permitted use or a use requiring a special permit, for example:

- 1) Stripping of vegetation, regrading or other development shall be done in such a way that will minimize soil erosion.
- 2) Whenever practical, natural vegetation shall be retained, protected, and supplemented.
- 3) The disturbed area shall be kept to a minimum.
- 4) Provisions shall be made to accommodate the increased runoff caused by changed soil and surface conditions during and after development.
- 5) Where necessary, temporary vegetation and/or mulching should be used to protect areas exposed during development.
- 6) Sediment basins (debris basins, de-silting basins or silt traps) shall be installed and maintained when necessary to remove sediment from runoff waters from land undergoing development.

- 7) The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 30 working days of completion of any phase of grading, be planted or otherwise provided with permanent ground cover, devices, or structures sufficient to restrain erosion.
- 8) Whenever land-disturbing activity is undertaken on a tract comprising more than one acre, if more than one contiguous acre is uncovered, a ground cover sufficient to restrain erosion must be planted or otherwise provided within 30 working days on that portion of the tract upon which further active construction is not being undertaken.
- 9) The development plan or land-disturbing activity shall be fitted to the topography and soils so as to create the least erosion potential.

L. Subdivision Control

With the exception of zoning, subdivision control is the most widely employed local land use regulator. The review of a subdivision plan occurs at a key point in the process of local land development. Given certain use, density and other requirements to be met under zoning, a subdivision plan (or site plan required for a special permit under zoning) represents how a particular development proposal will be fitted to a specific site. In many cases, it is the first indication to local officials of the full impact a proposed development will have upon their community. If properly utilized, this review process can also indicate the possible detrimental influence of proposed development upon overall water quality.

A subdivision plan submitted for local review should be required to include an inventory of the natural characteristics of the land to be developed. Proposed alterations to this natural landscape, as well as the anticipated effects of these changes would also be submitted. If provided in sufficient detail, this information will enable a community to assess possible negative water quality impacts from the planning, design and construction stages of subdivision development.

The natural processes of soil erosion and sedimentation are closely related to the drainage characteristics, storm water runoff and water quality in nearby surface waters. Local subdivision regulations should protect natural land drainage by:

- Allowing development to occur with only minimal disturbance to natural topography and vegetation.
- Requiring the prompt restoration of natural vegetation following construction.

To provide adequate drainage and to avoid the threat of flooding, specific measures to control erosion and sedimentation should be included in a sedimentation and erosion control plan, which specifies the location and timing of their use. This should be submitted as part of the overall subdivision review process and would cover both during the construction phase and afterwards.

The Subdivision Control Law, (G.L. c. 41 ss. 81K - 81GG) the enabling statute for local subdivision regulations, was enacted "for the purpose of protecting the safety, convenience and welfare of the inhabitants of the cities and towns...by regulating the laying out and construction of ways in subdivisions...and ensuring sanitary conditions in subdivisions and in proper cases parks and open areas". This legislative statement of purpose should be strictly construed. The only purposes recognized are to provide suitable ways for access furnished with appropriate municipal utilities, and to secure sanitary conditions. The extent to which subdivision regulations can be used to protect water quality, particularly off-site water quality, is an issue which has not been directly addressed by the courts. While the danger of pollution to adjacent wetlands from surface water runoff and the seepage of sewage through the soil structure and the resultant menace to marine life have been recognized as "matters of legitimate public concern", the validity of subdivision regulations designed to guard against these dangers has yet to be determined. Regulations insuring adequate drainage of the locus are within the scope of the law, even when it involves the "natural" drainage of the locus. Whether the drainage of adjacent areas outside the subdivisions is also a proper concern of the planning board is again an issue that has not been decided.

In order to be able to fully assess the impact of large-scale development, environmentally as well as financially, a requirement should be drafted at the local level requesting developers to submit an environmental impact report as part of the subdivision approval process. Such requirements need not apply to all subdivisions, only those large-scale, subdivision developments of community-wide or regional significance or those occurring in an environmentally sensitive area. This comprehensive statement of potential impacts of a proposed development will help a community in areas of concern beyond natural resource protection. It offers a useful tool for review of off-site and on-site effects of a large-scale development.

M. Performance Standards

The traditional form of zoning regulation is based on the establishment of discrete districts which permit specified land use and also prohibit or exclude certain activities. One consequence of this type of zoning, which relies on prescriptive districts is that, in order to make a district comprehensive enough to insure the prohibition of all possibly undesirable activities, inoffensive land uses are also eliminated from use in the district.

Dissatisfaction with the rigidity of traditional "use zones" and the resultant separation of land uses has fostered increased interest in the concept that land use regulation should be related, not to the land use alone, but rather to the effect of the land use. The idea of regulating uses by their external effect rather than by their name led to the development of performance standards. The use of performance standards means that the offensive characteristics of a particular use will be prohibited from a district, rather than banning the use itself.

If a regulatory approach uses performance standards, the description of a district is usually characterized by a list of uses that are permitted within a particular district if they meet specific conditions that are more or less scientifically measured. For example, an ordinance may establish an industrial zone and provide that any industrial use is permitted if it does not emit smoke or create noise beyond a specified measure based on a scientific standard. Other standards will be included to measure vibration, dust and other particulate matter, odor, toxic and noxious matter, fire and explosive hazards, humidity, heat and glare, radiation hazards, landscaping, enclosed parking, screening, etc.

Certainly the standards used as criteria in determining how activities must perform in particular areas of town should cover a broad spectrum of possible effects. In addition to the type of standards mentioned above, other criteria such as traffic generation, intensity of the development, or economic impacts would be likely criteria found in a regulation utilizing performance standards, and water quality standards could also be employed in this manner. One example of how a water quality related standard might be utilized in this type of an approach can be seen in regard to drainage and recharge. The regulation would contain standards for the maximum off-lot drainage permitted to take place in conjunction with any development or conversely, a minimum standard for on-lot recharge would be included which must be met by any development proposed for the area so regulated. Those land use activities which could meet the criteria established in this manner would be seen as having no negative effect on the area and therefore would not be excluded.

Currently there have been few legal challenges to the concept of performance standards. This is certainly true in those instances where there is a fairly strong scientific basis for the standards and where the language of the standards does not grant excessive discretion to the administering agency. By establishing measurable and specific criteria which are used in evaluating possible development, the approach of performance standards may reduce potential problems arising from the arbitrariness of administration.

As is true with any approach offering increased flexibility, a system of performance standards may place increased administrative requirements on those responsible for the execution of the regulation. The drafting of this type of regulation may require additional expertise, since in order to achieve the maximum benefits from this type

of approach, the standard should be designed for the specific situation of a community and not adopted in toto from models or those being used by other communities. The administration of such regulations by the zoning authority may involve a more detailed data base or more data on each development as it is proposed.

N. Growth Management

Traditionally, in the field of local land use regulation, the techniques employed have not generally been directly oriented to the issue of growth. Rather, mechanisms have been used which are directed at the type of development that is occurring within the community. It has often been the philosophy of land use regulation that by controlling the type and quality of development, the community would be handling the issue of growth.

Recently, as communities have experienced periods of rapid growth, traditional regulatory mechanisms have seemed to be inadequate in allowing towns to manage their growth. Rapid growth has meant that the town's services and facilities have been overburdened, and that the demand for additional services has placed significant financial pressure on the communities.

The demand for services and facilities began to indicate that it was not entirely the type of development creating the difficulties but rather the pace or rate of growth in the town. Often growth was occurring rapidly and creating difficulties, while if this same amount of development had taken place over a longer time span it could have been more easily assimilated by the community.

More recently communities have begun to use or consider a type of regulation which does address the issue of growth directly. This type of regulation is concerned with the amount of development which occurs, plus the sequencing or timing of development. As a group, this type of regulation is referred to as a growth management system.

There are several types of growth management or phased growth systems, which have received substantial coverage in recent years. Often each type of approach became identified with the particular community in which it was first applied. Regardless of differing aspects of the approaches, they do have a common purpose - that of regulating the amount or timing of new development, thereby exerting control over the rate of growth.

Growth management systems allow development to occur at a rate which does not place undue burdens on municipal services by allowing development to be assimilated into the community. It affords the municipality the opportunity of rationally planning for the accommodation of growth on a long-term basis and reduces the necessity of short-run decision-making.

A typical regulation aimed at controlling the timing and sequence of future growth is often based on a comprehensive plan for the town and also involves an adopted capital improvement program which projects the staging and sequential provision of necessary municipal services to all areas of the town. This data provides the framework for the rational accommodation of anticipated growth. Further development must occur within the framework established by the community. Anyone wishing to develop land must do so in accordance with the comprehensive plan's capital budget program's scheduling. This type of approach grants permission to develop land on a rating of point system in which a proposed development receives points by having adequate provision of a variety of necessary services. Such service could include sanitary facilities, drainage facilities, parks and recreational facilities, schools, roads and transportation facilities, etc.

Regardless of the particular aspects of each type of growth management system, they do share some common points.

- They attempt to ensure that future growth will be adequately planned and provided with the facilities and services necessary. This organized delivery of services can result in reducing the cost to the municipality by properly coordinating the construction of capital improvement projects.
- They all provide an alternative to a spiral and leapfrogging of future growth. This alternative can result in increased protection to the town's environment, in the prevention of damage to sensitive or critical environmental areas, and in an increased level of environmental amenities.
- This type of regulatory system also offers some predictability to both the town residents and investors as to when certain portions of the community will develop and when municipal services will be available.

However, these regulations do present some difficulties which should be considered when deciding to utilize them. An important consideration is the initial cost to the locality. Since the development and implementation of such regulations requires substantial comprehensive planning and capital improvement programming expertise, an increased level of local spending while studies are being conducted should be expected.

This type of control for staging growth can temporarily convey increases in value to some lands, and conversely, losses in value to other lands. Provisions must be made to ameliorate such losses, such as reduced tax assessments. If this regulation had the effect of substantially curtailing development and, as a result, the assessments on undeveloped property were reduced accordingly, the impact on a small town could present some financial difficulties.

While the use of growth management technique can have significant environmental benefits, especially in protection of water quality and open space, they should not be used with only the environmental goals in mind. It is important that the individual community's action consider multi-community and area wide needs for housing (in all price ranges) and economic development as defined in the MAPC'S regional housing and land use (PLUMB) documents.

O. Transfer of Development Rights

Land use regulations typically impose limitations on the expectations of individuals to develop their land as they wish, sometimes directly confronting the individual's economic motivation to profit from the use of his property. Despite this, typical regulations make no provision for compensating those whose land is regulated. With each tract of land regulated, therefore, some loss in value is ordinarily imposed, without compensation, in the furtherance of the public health, safety, and the general welfare. The immediate and obvious impact is usually to diminish the value of privately owned property. A pervasive effect of the zoning process is that large increments of land value are destroyed, created, transferred and conferred. This occurs without any effort being made or mechanism being available to adjust the highly disproportionate land valuations that are produced.

Communities which have attempted to restrict the use of certain natural lands, for example, realize that regulations which prohibit all use of the land are often challenged on the basis that they deprive the owner of his property rights without compensating him for the loss. The technique of transfer of development rights (TDR) attempts to bridge this gap between private property and public regulation. TDR is based on the notion that landownership consists of a bundle of rights which can be separated and sold individually. In other words, an owner of land can separate his right to develop the property from his other rights (e.g., access, agricultural use) and place a value on that right.

While there are many variations of how a system of transfer of development rights could operate, a general system can be sketched here to indicate how a program might operate to protect water quality. The jurisdiction within which the TDR system is to function would prepare a comprehensive plan designating areas within the community to be developed as residential and commercial (development zones) and areas to be kept as open space or rural-agricultural fringe lands (restricted areas). Restricted areas would be water-related lands or critical areas such as wetlands or aquifer recharge areas which, according to the community's comprehensive plan, should be regulated in order to safeguard water quality. Development zones would be areas of the community that were served by municipal services (sewer and water) and which were able to support relatively high densities of development without threatening water quality or other environmental degradation.

Central to the concept of TDR is the notion that development rights can be transferred from one parcel to another. In this example, the owner of the land in the restricted zone could sell (thereby transferring) his rights to an owner of land in the development zone. Both parties would stand to gain from such an arrangement. The owner of the restricted land (which might be a wetland for example) cannot use his development rights on his own property due to the regulations that have been applied, yet he can profit from the land by selling his rights. He also receives a tax advantage since his land is now re-assessed at a lower value, reflecting the elimination of the right to develop his property. The owner of the land in the development zone on the other hand can develop his property at a certain density under current zoning, yet if he purchases development rights, he is allowed by the town to build at higher densities than would otherwise be permitted. Therefore, it is to his economic advantage to purchase the rights.

A system of development rights transfer would require more administrative expertise than some of the more traditional regulatory techniques discussed earlier in this chapter. Being a more complex system of regulation, a transfer of development rights scheme might not be suitable for all communities, but its advantages make it an attractive proposal for certain municipalities. One advantage of this type of approach is the fact that except for initial costs in increased planning studies and determination of the number of rights to be assigned to certain properties, there is no on-going cost to the municipality except for administration. The private market conducts the transactions for compensation to landowners and acquisition of necessary development rights, while the community receives the beneficial effects of the spatial location of the development. More importantly from a water quality perspective, this type of system allows a community to protect critical water and land resources while accommodating desired commercial, industrial and residential growth.

P. Acquisition of Land

One of the most effective means of protecting critical environmental lands from development is outright purchase of the parcels in question. Local regulatory controls discussed thus far are based on the assumption that sensitive environmental areas will remain in private ownership, and thus the uses to which they are put must be regulated so as to prevent water quality problems. Obviously, if these lands are in public ownership these regulatory programs are unnecessary.

Many communities have active conservation programs, and many environmentally critical lands including wetlands, floodplains, shorelines of water bodies, and watersheds of reservoirs have been protected through acquisition. The obvious drawback to these programs is expense. Land costs are high and are steadily rising. As a result, communities must often look to less expensive methods of protection.

Partial acquisition is an option which is less expensive than full purchase, and affords a high level of protection. A community can purchase easements on property and thereby prohibit certain activities from occurring.

Rights of ownership are, in effect, separated. For example, the community purchases the rights to develop the land, while the private owner retains the remaining rights. Partial purchase is less expensive than full ownership (though in some cases not significantly so).

(Readers interested in a full description of funding programs for acquisition of land, primarily open space, should consult MAPC'S "Open Space and Recreation Plan for Metropolitan Boston, Vol. 1, (revised), 1976," pages 105 through 108.)

Q. Conservation Restrictions

Under Massachusetts law (Chapter 184, s.31-33 of the General Laws) private property owners may relinquish certain property rights and thereby ensure that the land will remain as undeveloped open space. No payment is made to the private owner. His or her incentive is usually tax-related. The owner and the community (or other body) agree to certain restrictions on the land - which can include restriction on all development, on dumping, removal of vegetation, excavation activities which would be detrimental to natural drainage or water conservation, or which would contribute to erosion problems. With the imposition of these restrictions, the land's value is lessened, and it is re-assessed at a new value. The use of conservation restrictions is also attractive to the community in that it offers protection of critical environmental land at a low cost.

R. Wetlands Protection

Massachusetts General Laws provide for two programs of wetlands protection. Under Chapter 131, section 40, local conservation commissions are empowered to review all proposed development of wetlands areas within their town boundaries. If a proposed development is to occur on land which is significant to water supply, flood control, prevention of pollution or other factors, the commission may stipulate the conditions under which the development may take place. Appeals are made to the state's Department of Environmental Quality Engineering (DEQE).

Under Chapter 131, therefore, permits are granted by a local board after the developer has expressed a specific intent. Under another section of the General Laws (Chapter 130, section 105 and Chapter 131, 40A) restrictions are placed on the land before development is imminent. Under the Coastal Wetlands Restrictions Act and the Inland Wetlands Restrictions Act, the commissioner of environmental management may issue orders regulating the use of certain wetlands in the state to ensure that they will remain in a natural state.

II. WATER CONSERVATION

A program initiated to reduce water consumption is a positive step toward long term maintenance of high quality and quantity water in the region. During the course of the 208 wastewater study water conservation techniques have been publicized, investigated and utilized with success by many community organizations in the greater Boston area.

A. The Benefits

Water conservation programs can produce benefits for water quality and quantity in various ways including financial savings for the municipality, as well as the individual homeowner. Less water consumed means less wastewater to treat, since approximately eighty five percent of residential water consumed is discharged as wastewater. A reduction in wastewater can mean a more efficiently operating on-lot subsurface disposal system and can increase the useful life of the system. In terms of municipal treatment facilities or private package facilities, reduced water consumption means less wastewater needing treatment and therefore, a reduction in the size and cost of the facility. A reduced volume of wastewater being treated will also mean reduced sewer charges for those using the system.

Most user charge systems being developed to meet the requirements of the Federal Water Pollution Control Act, are based on water consumption as the most equitable method of cost recovery. While the user charge must first assure that each recipient of waste treatment services pays their proportionate share of operation and maintenance costs. A user charge system based on water consumption by its nature offers incentives for water conservation. Quantity discounts are not allowed. When user charge systems are based on estimated water consumption some abatement procedure should be established to benefit those customers using less than their estimated consumption. The water conservation savings for the industrial user would be even more significant since industry must make payments over a period of years to the industry's allocated share of the federal treatment facility construction grant money.

The Clean Water Act of 1977 amended the industrial cost recovery requirements somewhat to allow the exemption of industries discharging 25,000 gpd or less of sanitary waste from the industrial cost recovery (ICR) provisions. More important in terms of water conservation, a sec. 201 grantee that received a grant prior to the enactment of the Clean Water Act of 1977 may reduce the industrial cost recovery payments of an industrial user if the grantee requires the industrial user to adopt other means of reducing the demand for waste treatment services through a reduction in the total flow of sewage, or by eliminating unnecessary water consumption. Additionally, water conservation techniques can maximize the utility of existing water supply resources and can delay or avoid the costly work of exploring for increased sources of water supply.

Residential water use accounts for approximately one half of the total water consumed by the community. For example, on the average:

- Toilets consume five gallons per flush.
- Showers - five to six gallons per minute
- Washing machines - 40 gallons per load.
- Dishwashers - six gallons per cycle
- Lawn sprinklers - 120 gallons per cycle
- Household - 175 gallons per day.

Studies at the state and community level have examined a number of relatively simple and inexpensive programs and devices which they say can save between 5 and 20 percent of the water used by a community over a long period. These are savings which might be expected by a community utilizing the following techniques:

- use of toilet inserts and aerated showerheads = 5% savings
- home leak detection and maintenance = 5% savings
- residential watering restrictions = 5-20% savings

A local program of public education should be undertaken to create public understanding and support for changes in town regulations, plumbing codes and state law and to create a demand for water-saving appliances and devices so that they will be readily available to buyers who choose to use them.

To be successful in developing a comprehensive and effective reduction in community water consumption and in changing habits and attitudes toward water use a local education program should be highly visible and involve a broad range of community interest groups. The education program should have an established time frame and a well planned approach to address the specific needs of the homeowner, local industry, the municipal decision makers and local business people.

B. A Sample Program

The following outline is a possible model for a month-long municipal public education program. A community group should initiate and coordinate the effort. In some communities the local League of Women Voters, Womens' Club, Rotary or Selectmen have fulfilled this role with great success.

To generate public information about water conservation:

1. A community-wide water conservation month should be announced by the local officials in the media.
 - at least one major town wide event should be sponsored to highlight the month.
2. Water conservation leaflets distributed in water bills to outline financial incentives for water conservation by homeowners.
 - money for printing might be obtained from local banks, industry or business as a public service.
 - writing and production of leaflet could be done by members of the sponsoring organization or volunteers from the local library, school system or newspaper.
 - or with encouragement, the water utility itself might cover the writing and printing costs.
3. Workshops built around the benefits of water conservation should be planned for different parts of the community, i.e.,
 - homeowners - savings in water bills, water heating, sewer use charges and on-lot disposal system maintenance.
 - industries or business - major financial savings involved in water conservation, reuse and recycling, especially if user charges are applied.
 - municipal officials - to encourage local regulations and programs, such as, user charges, plumbing code regulations, subdivision and new construction water use controls, water pricing methods, encouraging community or organization purchase and generation of water conservation kits.
 - students - water conservation study units in community schools to encourage home conservation (teaching units available through the New England Aquarium); poster, essay or slogan contests could be used to stir interest.

One of the first steps for this workshop would be to identify individuals who have successfully initiated conservation programs in their community. Experiences and ideas from other communities would provide the basis for these meetings.

4. The final event might be a Conservation Fair consisting of:
 - a display of water conservation devices including new ideas developed in the community.
 - all student projects displayed (posters, store front displays essays, slogans, etc.), with prizes to the most creative.

- water conservation kits for sale at all local supermarkets etc., (fraternal and service organizations have sold these kits as fund raisers).
- garden club displays on garden mulching to reduce watering.
- films on conservation.
- local and regional media asked to cover the day as a follow-up of the monthly events.

C. Additional Techniques

Other actions suggested to encourage water conservation include:

- Regulatory changes to clearly allow the use of humus or composting toilets. While Title 5 of the State Environmental Code allows the use of humus toilets provided a full-sized, properly functioning subsurface disposal system is available or can be constructed there are other regulatory constraints to the use of humus toilets. The State Plumbing Code still requires that each family dwelling be equipped with at least one water closet. Moreover, Article II of the State Sanitary Code generally prohibits the use of privy or chemical toilets and requires that every toilet be connected to the water distribution system and to a sanitary drainage system. These minor regulatory impediments and inconsistencies should be amended.
- The full implementation of the water conservation principle expressed in the State Plumbing Code which states "Plumbing must be designed and adjusted to use the minimum quantity of water consistent with proper performances and cleaning." When State Plumbing Code standards prohibit consideration of otherwise acceptable water conservation techniques that section of the Code allowing consideration of "alternate materials, methods and systems" (reg. 6.2.18) should be invoked.
- At the local level, the regulation of certain nonessential outdoor uses of water is encouraged, along with the development of water charge rate systems which provide incentives for water conservation.
- Adoption of State regulations dealing with sewer extensions and connections (G.L. c.21 s.43(3)) which, while giving municipalities and sewer districts primary control over most connections, permit the state agency (DWPC) to exercise greater control over the introduction of industrial wastes into municipal systems, and regulations which would give greater state control over the development and enforcement of local sewer use ordinances. This regulatory program could include water conservation measures, such as requiring, as a permit condition, the installation of water-saving shower heads, toilets, etc., especially in communities where sewerage could result in the depletion of groundwater supplies.

The successful use and development of water conservation techniques and habits rests upon a strong public information and incentive programs designed to stress the value of clean water as a limited resource and the benefits available to communities who minimize their consumption and waste of water.

III. ON-SITE SEWAGE DISPOSAL

A. Operation and Location

A large percentage of the population of the metropolitan area utilizes on-site sewage disposal systems. The most common systems used are cesspools and septic systems. New cesspools are not permitted by the state environmental code because they do not provide adequate treatment. Septic systems, if functioning properly, are an effective and relatively inexpensive means of wastewater disposal. However, not all septic systems operate properly. The combined impacts of a number of malfunctioning systems can cause major water pollution problems.

Even the best septic system does not purify water completely. While bacteria can be removed effectively, a number of other substances pass through the soil unaffected. Ninety percent of the nitrogen in wastewater, for example, is not removed in septic systems. When nitrogen reaches the leaching field it is oxidized to produce nitrates.

Nitrates, and similarly phosphates, are not removed as they pass through the soil. Nearly all these substances eventually reach ground and surface waters. Nitrates and phosphates stimulate the growth of aquatic vegetation, which can choke the waterbody with weeds and severely upset the oxygen balance. A build-up of nitrates in drinking water is a serious health hazard; high nitrate levels have been shown to cause Melaglobanemia, more commonly known as blue babies.

Septic systems utilize natural soils and geologic conditions to treat wastewater. Their correct siting is of the utmost importance to ensure proper functioning and waste removal.

- Septic systems located in poorly drained soils are not likely to function properly. Placement of leaching fields in wet soils, where the groundwater table is high, is undesirable since wastewater will not be filtered by soil, but will instead enter either groundwater untreated or rise and run off to surface waterbodies.
- Impermeable clay soils or thin layers of soil on ledge do not provide sufficient filtration of wastewater. Partially treated waste (still containing harmful bacteria) will reach bedrock, enter fissures and travel to groundwater reservoirs.
- Dense placement of septic systems around lakes and ponds can contribute excessive amounts of nutrients to water bodies. Fertilization of a pond speeds up growth of weeds and plants. The pond may fill up with vegetation in a matter of years - becoming clogged and effectively killed. A number of ponds in the Boston area have experienced eutrophication problems - such as Lake Holbrook in Holbrook and Pillings Pond in Lynnfield.

- Very well drained soils may appear to be ideal locations for septic systems, yet wastes may pass so rapidly through soil that they may not be removed. Untreated pollutants then enter groundwater and even surface waterbodies in certain cases.

A septic system consists of a water tight structure (usually concrete, steel or fiberglass) connected to a leaching area or absorption bed. Sewage flows into and is held in the tank where solids settle to the bottom and where natural bacteriological processes decompose some of the organic matter in a "septic" (airless) environment. Lighter materials such as grease and scum flows to the top of the tank and are held there. The wastewater flows out of the tank to a leaching area located underground, or in a mound, consisting of perforated pipes surrounded by gravel and soil.

The leaching area utilizes soil to treat the effluent. Nearly all soil contains large amounts of bacteria which can digest and oxidize organic materials in effluent. As the effluent passes through the soil, suspended matter is filtered out.

The effectiveness of a septic system depends, in part, upon the ability of the soil to receive and treat wastewater. Well drained and moderately well drained soils (mixtures of sand, gravel and loam or clay) are well suited for septic systems while poorly drained soils such as bedrock, wet soils and soils with a very high clay content do not typically provide adequate treatment.

At a minimum, the following locational and construction guidelines should be adhered to:

- Locate septic systems where soils provide adequate drainage for effluent.
- Locate in relatively flat areas of less than a 15 foot rise for every 100 feet of horizontal distance.
- Place leaching area at least 4 feet above the groundwater table and no less than 50 feet from surface waterbodies.
- Do not locate septic systems near drinking water supply recharge areas, floodplains or wetlands.
- Avoid the compaction of soil in the leaching area by use of heavy equipment such as front end loaders.
- Avoid smearing of the sides or bottom of the leaching bed during construction. The ability of the soil to absorb effluent will be diminished as a result.
- Avoid depressions or ruts in the field which will cause either either an uneven distribution of the effluent or ponding.

To ensure the proper functioning and long life of septic systems, they should be properly maintained. At a minimum, the following guidelines should be followed:

- 1) Pump the septic tank regularly, at least every two years, more often in some areas or if indicated by periodic inspection.
- 2) Minimize water uses in the home. Excess water will decrease the effectiveness of the septic tank and lead to flooding of the leaching area. Never empty basement sumps or other sources of clear water into the system. Run dishwashers and washing machines only with full loads. Fix leaky faucets and toilets promptly (see previous discussion on water conservation).
- 3) Avoid disposal of the following substances in the system:
 - Coarse Organic Matter - Vegetable trimmings, ground garbage, sanitary napkins and coffee grounds will clog the septic tank with sludge and require frequent septic tank pumping.
 - Fats and Grease - Automotive oil should never be put into the septic system. Cooking oil and bacon grease, etc. may pass through the septic tank and clog the leaching area causing the system to back up.
 - Chemicals - Pesticides, disinfectants, acids, medicines, paint, paint thinner, etc., will kill the bacteria which decompose organic matter in the septic tank thereby causing increased sludge accumulation and more frequent pump-outs to keep the system operating properly.

B. Regulation

A comprehensive water quality management system must therefore deal with subsurface sewage disposal from two aspects. First, by establishing effective control programs which ensure that systems are installed in a manner and in locations where they will not create water quality problems and which can effectively deal with failing systems. Second, by instituting management programs which will ensure that on-site sewage disposal can be relied on as a reliable and environmentally sound wastewater treatment alternative to large and expensive municipal treatment facilities.

Title 5 of the State Environmental Code is the primary state regulation dealing with subsurface sewage disposal. Title 5 is promulgated pursuant to Chapter 21A, section 13 of the General Laws, added by Chapter 706 of the Acts of 1975, which directs the commissioner of DEQE to adopt, and from time to time amend, regulations which are to be known as the State Environmental Code.

Section 13 of Chapter 21A of the General Laws broadens the purpose of the State Environmental Code to include not only "the health and well-being of the public" (as stated in General Laws, Chapter 111, section 127A, the enabling authority for Article XI of the State Sanitary Code which previously regulated subsurface sewage disposal), but also "matters affecting the environment." Public health must still be considered in the environmental code, but other environmental concerns must now be given equal consideration.

Subsurface sewage disposal practices previously allowed under the State Sanitary Code must be reconsidered with regard to their impact on the environment. It is likely that practices which have minimal public health effects may result in the serious degradation of the environment. The pollution of groundwater is one such area that must be re-evaluated. The legislature has clearly indicated that subsurface disposal of sewage must not be done in a manner harmful to the environment, and every effort must be made to ensure that the tools provided by the legislature are used for the purposes for which they were intended.

Title 5 of the State Environmental Code requires a permit for the construction of individual sewage disposal systems (sec. 2.1 of Title 5). It also requires that installers of individual sewage disposal systems and persons engaged in the pumping-transport of the contents of such systems must also have permits (secs. 2.2 & 2.3). All of these permits are issued by the local board of health pursuant to the minimum standards set forth in Title 5, except that DEQE must approve the plans for any system on any lot where the total volume of the sewage which must be disposed of is in excess of 15,000 gallons per day.

Local boards may, of course, adopt stricter standards under the broad authority of section 31, Chapter 111 of the General Laws. A construction permit is good for two years from the date of issue unless construction has commenced (sec. 2.4). The permit application must be accompanied by a plan showing, as a minimum: the lot to be served, location and dimensions of the system, design and calculations, existing and proposed contours, location and log of deep observation holes, location and results of percolation tests, location of any streams, surface and subsurface drains and wetlands within 100 feet of the system, known sources of water supply within 200 feet of the system, location of any proposed well to serve the lot, location of water lines on the property, maximum groundwater elevation in the area of the sewage disposal system, and a profile of the system (sec. 2.5).

Individual sewage disposal systems cannot be approved where a common sanitary sewer is accessible, and where permission to enter such a sewer can be obtained (sec. 2.12). Individual systems must be designed to adequately treat the sewage flow estimates set forth in the regulations according to the type of establishment (sec. 2.13). The use of a subsurface sewage disposal system by more than one lot is prohibited (sec. 2.18). However, a variance may be provided from this prohibition, particularly where such systems are publicly owned. The owner of the system must maintain the system and have it cleaned or repaired when ordered by the local board of health. The board of health may cause the works to be cleaned or repaired and all expenses incurred to be paid by the owner. Systems must be "maintained in a manner that will not...cause the works to become a source of pollution to any of the waters of the Commonwealth" (sec. 2.19).

Each system, including the leaching area, must be provided with a reserve area of equal capacity to the existing system (sec. 2.22). Before issuing a Sewage Disposal Construction Permit, a representative of the approving authority must perform a site examination, witness the deep observation holes (at least 2 per lot required) and witness the percolation tests (at least one in the site of the leaching area required). The leaching area requirements, for both sidewall and bottom area, are set by the measured percolation rates. Soils with percolation rates of over 30 minutes per inch are unsuitable. There is no minimum percolation rate.

Disposal facilities, particularly leaching areas must be at least 100 feet from a well or suction line; 100 feet from surface water supplies, including reservoirs and their tributaries; and 50 feet from all other watercourses (sec. 3.7).

The septic tanks must have an effective liquid capacity of 150 percent of the design flow estimated, but in no case less than 1,000 gallons, but where garbage grinders are used the capacity must be 200 percent of the design flow but not less than 1,500 gallons (secs. 6.1 and 6.2).

Grease traps must be installed in systems where large quantities of grease can be expected to be discharged. Grease traps must be inspected monthly and cleaned at least every three months.

The leaching area, whether it is a pit (which is preferred), gallery, chamber, trench or field, must be at least four feet above the maximum groundwater elevation.

The new code allows the use of humus toilets provided a full-sized properly functioning subsurface disposal system is available or can be constructed on the lot (sec. 17.2). There are, however, other existing regulatory constraints to the use of humus toilets. The State Plumbing Code requires that each family dwelling be equipped with at least one water closet (sec. 2.7 of the State Plumbing Code), while Article II of the State Sanitary Code generally prohibits the use of privy or chemical toilets and requires that every toilet be connected to the water distribution system and to a sanitary drainage system (reg. 3.3 and 9.2 of Article II).

As was previously stated, anyone pumping or transporting the contents of privies, cesspools, or septic tanks must obtain a permit from the local board of health. The application for the permit must state the disposal site, and the location and method of disposal must be approved in writing by DEQE.

Variances to the provisions of the code (except where expressly prohibited) can be granted by the local board of health, where strict enforcement of the code would do "manifest injustice" and the applicant can prove that the same degree of environmental protection required can be achieved without structural application of the particular provision. DEQE can disapprove any locally granted variance (sec. 20).

The local board of health can order persons to comply with violated provisions of the code and must provide such persons with notice of the order and the opportunity for a hearing, upon request. Penalties for violation of the code can be as much as \$500. Failure to comply with an order of the board of health can also result in a \$500 fine with each day's failure to comply constituting a separate violation.

While the recently enacted Title 5 is an improvement over earlier subsurface disposal regulations, some additional changes can be made to make it more responsive to the implementation of final 208 plan recommendations. The prohibition against the communal use of subsurface sewage disposal systems should be relaxed to clearly allow the multiple use of subsurface sewage disposal systems in some circumstances such as: when existing systems pose a threat to public health, safety or water supply and the communal system is the cost-effective sewage disposal alternative; when the communal

systems are publicly-owned (a publicly-owned communal system is presumably allowed under existing statutes as a publicly-owned wastewater treatment facility); or when the rights and responsibilities of the users of the system for its operation, maintenance and repair are clearly established including the right to inspect the system, the obligation to pay a proportional share of the cost of construction, operation, repair and maintenance of the system, and the obligation to use the system in a manner which would not damage the system. The Clean Water Act of 1977 further supports the need for such a change since under that act 201 grants for privately owned treatment works serving one or more principal residences or small commercial establishments are available providing certain requirements are met by the public body applying for the grant, including assurances that such treatment works will be properly operated and maintained and that an acceptable user charge system will be instituted to pay for operation and maintenance costs.

Other changes for Title 5 could include a mandatory inspection and maintenance (when necessary) provision, perhaps every three years as a minimum, and a provision that access manholes be clearly and permanently marked to facilitate maintenance. Groundwater determinations, through the digging of deep observation holes, should be prohibited, at a minimum during the months of June through October, when the groundwater elevation is likely to be exceptionally low.

As noted above, local boards of health may adopt stricter regulations if they believe such regulations are necessary. The MAPC Water Quality Project does not advocate stricter standards unless local conditions truly warrant them, and in no case should such regulations be used solely to impede otherwise allowable development.

In terms of programs to ensure that on-site sewage disposal can be relied on as a wastewater treatment alternative perhaps the best way to ensure that systems, once they are installed, continue to operate properly is through periodic inspection and maintenance.

Public information programs designed to make homeowners aware of the benefits of regular maintenance are helpful and have been instituted in some communities (Wayland and Holliston, for example).

A mandatory program may be necessary if continued long-term reliance on subsurface sewage disposal is the community goal. Inspection and maintenance programs will clearly put a fiscal and administrative burden on local boards of health. While it must be remembered that such a program could alleviate the need for more expensive treatment facilities in some situations; that some elements of an inspection and maintenance program could be eligible for 201 funding (i.e., the vehicles and associated capital equipment required for servicing the systems); and that such a program could provide the assurances sought by EPA that privately owned systems funded under section 201 (as amended by the Clean Water Act of 1977) be properly operated and maintained, nevertheless, the impact on local boards of health could be substantial. Full-time staff would be required, and technical expertise in the installation, inspection and maintenance of subsurface disposal systems would be a necessity.

Although boards of health have clear authority to order cleaning and repairing of systems, that authority is not restricted to failing or nuisance systems. Rather, local boards can adopt reasonable regulations to prevent nuisances such as mandatory maintenance programs that include registration, periodic inspection and cleaning when warranted. Two provisions of Title 5 are applicable to mandatory maintenance programs. The first states that "septic tanks should be inspected and cleaned at least annually" (sec. 6.16), while the second provision requires that every owner of a system must "keep the sewers and disposal systems in proper operational condition and shall have such works cleaned or repaired at such times as ordered by the board of health" (sec. 2.19). Clear policy preference is expressed, therefore, for annual inspection and cleaning, and furthermore, there is clear authority in Title 5 to order cleaning and repairing of the system.

It should be noted that the authority of local boards of health to regulate on-lot waste disposal does not spring solely from Chapter 21A of Section 13 of the General Laws (or Chapter 111 Section 127A or Section 127, previous enabling statutes on this issue). Rather, local boards also have the authority under Chapter 111 Section 31 to adopt reasonable health regulations, and under Chapter 111 Section 122 to issue regulations to prevent nuisances. In adopting regulations local boards of health need not cite the specific enabling authority for such regulations, and, in fact, the regulations need not be based on only one section of the General Laws.

C. Sample Inspection/Maintenance Programs

A community could adopt, through board of health regulations, a mandatory septic tank maintenance program requiring registration and periodic inspection and cleaning of private disposal systems under the authority of some or all of the enabling statutes cited above. If the homeowner does not voluntarily consent to the inspection, a search warrant would have to be obtained. However, the "probable cause" standard for obtaining such a warrant could probably be met by showing the need for period inspection of certain facilities, in this case, septic tanks. There would be no need to show cause to believe that substandard conditions dangerous to the public are actually being maintained.

Developing a program requires coordinated private and municipal effort. The three model programs described in this section have one factor in common - benefits of successful local cooperation and implementation accrue directly to those whose money supports the program. However, state and federal government should be aware that additional funding will encourage rapid adoption of local programs by removing the possible negative impacts on property tax rates. The expanded funding can be justified as less costly than sewerage alternatives and more consistent with environmental and growth policy goals.

A community can initiate an inspection/maintenance program by utilizing:

- a municipal inspection team with town ownership of septage pumping equipment and inspector's vehicles;
- a municipal inspection team with private ownership of septage pumps;
- a private inspection team and privately-owned pumping equipment.

1. Municipal Inspection with Publicly-Owned Pumping Service

Costs of staffing and operating a program with full municipal control and equipment ownerships are shown in Table 1 for a town with 3,000 existing septic systems.

Three full-time inspectors are adequate during start-up, fewer will be necessary once the program overcomes some initial barriers and each inspector completes more than the required two inspections per day. At this minimum rate, each system would be inspected once every 30 months. During the initial phase of the program, about one-half of the systems probably will require cleaning. Since the three inspectors will inspect only 1,200 systems per year to start, about 600 pumping jobs will be likely. Once the program is underway for three years, owners of septic systems will receive the following service and bills:

- costs of inspection will be distributed equally among all owners; costs of pumping will be borne only by those whose systems require pumping;
- inspection - once every 30 months initially - decreasing to every 20 months and costing about \$30 per inspection;
- cleaning - once every two to three years at \$30 each job or \$10-15 additional per year.

Charges for septic system pumping are separated from inspection costs and billed to owners whose systems require cleaning service. Pumping costs vary inversely with the number of systems pumped each year. Table 2 shows costs ranging from \$20 each if 1,000 systems are serviced to \$50 per cleaning when annual service totals 400 jobs. With federal assistance in purchasing the pumper truck, costs decrease about 20 percent and range from \$16 to \$41 per job.

2. Municipal Inspection with Private Pumping Service

By utilizing services of private pumpers a town could avoid getting into the septage hauling business and perhaps take advantage of lower cost per pumping offered by an existing network of large private haulers. Private Massachusetts firms charge from \$20 to \$75 per pumping with most domestic jobs averaging about \$30. Since costs of municipal inspection personnel would remain similar to those in the preceding program, the system owner will realize savings when private haulers can pump at lower costs than town-operated units. Since town-owned pumpers are totally user-supported, municipal cleaning costs may exceed average private fees if less than 600 tanks are pumped annually.

Employing services of private firms cannot absolve local officials of responsibility for ensuring that acceptable methods of disposal are used by haulers involved in a town-supported maintenance program.

3. Private Inspection and Privately-Owned Pumping Equipment

With policy support by local officials, an inspection and maintenance program could be designed to be run by private firms under contract to the town.

TABLE 1
INSPECTION-MAINTENANCE PROGRAMS

MUNICIPAL STAFF AND TOWN-OWNED SEPTAGE PUMPER*

<u>Personnel - Inspection Team and Vehicles</u>	<u>Subtotal</u>	<u>Yearly Total</u>
Chief inspector: one (1) @ \$12,000	\$12,000	\$12,000
Assistant inspector: two (2) @ \$10,500	21,000	21,000
Clerk-Secretary: one (1) @ \$8,000	8,000	8,000
<u>Vehicles - Inspection Team</u>		
Three vehicles in use 200 days/year		
Debt service 6-year vehicle life		2,500
Operating, maintenance, insurance		
15,000 mi. each year @ 0.15/mi.	6,750	6,750
		<u>\$50,250</u>

5-31

SEPTAGE PUMPER UNIT

<u>Personnel</u>		
Operator-Driver (1) @ \$10,000	\$10,000	\$10,000
<u>Vehicle</u>		
Pumping truck \$20,000		
Amortization and debt (8% interest)		
service over 5 years	6,440**	6,440**
Truck operation, maintenance, insurance		
15,000 mi/yr. @ 0.25/mi.	3,750	3,750
		<u>\$20,190</u>

* Source: MAPC Water Quality Project, May 1977

**With federal repayment (sec. 201) of 75% of purchase cost at 1/5 balance due per year, subtract 3,750/year.....\$16,440

TABLE 2

SEPTIC TANK PUMPING COSTS

Number of Systems Serviced Annually	Approximate Cost to owner without Federal Assistance	With Federal Assistance
400	\$50	\$41
600	\$34	\$27
800	\$25	\$21
1000	\$20	\$16

However, inspection and pumping interests should be separate to avoid compromising the objectivity of inspectors.

IV. LANDFILLS

Many landfills in the MAPC 208 area do not meet state operating standards. Abandoned landfills in several communities are not capped and continue to release contaminated water to surface and ground water bodies. The volume of solid waste generated in the region continues to grow, however, indicating that the problem is not likely to resolve itself without action at all levels of government and by the private sector.

A. Siting

DEQE has authority under section 150A of Chapter 111 to regulate the siting, operation and maintenance of solid waste facilities. The local board of health must assign the sites of any facility for disposing refuse. Aggrieved parties may appeal to the DEQE. The assignment may be rescinded by the local board of health or by the DEQE if it is determined that the operation or maintenance of the facility is causing a nuisance or a danger to the public health.

State landfill regulations specify that facilities shall be located only at sites where the potential for air, land, and water pollution is minimal. Wetlands and floodplains are specifically excluded except where there is no alternate site and the effect on flooding and water pollution will not be significant. Public and private water supplies must be protected, and refuse must be placed no less than four feet above groundwater and 60 feet from surface water. Plan submissions to the DEQE must include detailed hydrogeologic investigations to assess groundwater conditions and on-site soil suitability for cover material.

While these siting regulations prohibit the selection of bad locations, they fall short of ensuring the selection of excellent sites which offer little or no potential threat to water quality and exceptional leachate attenuation characteristics. For instance, while some authorities recommend that landfills not be established in sandy areas having rapid soil percolation rates, several new fills have been located in such areas. Studies have proven that most pollution travels more rapidly and further in permeable soils, increasing the possibility that leachate may reach the groundwater system. Furthermore, use of the permeable on-site soil as cover will allow rainwater easy entry into the fill resulting in leachate generation.

Depending upon local surficial geology, exclusion of permeable sites from consideration in landfill location may preclude landfilling in certain towns due to the prevalence of permeable strata. In the absence of alternative sites, landfills on permeable material should be designed and constructed with systems to control leachate generation or migration or both. In the vicinity of an aquifer, groundwater monitoring should be conducted as a measure to ensure that leachate control systems are operating as planned. Control systems could include combinations of impermeable liners beneath and above the fill, leachate collection drains beneath the fill, or pumping and treatment of surface and groundwater. While these techniques may be effective, they substantially add to operating costs.

Should a preventive system fail, a permeable soil site will offer little protection to surface and groundwaters, as coarse sand and gravel deposits provide little filtration of leachate constituents. In the absence of leachate collection systems, the minimum distance to groundwater in permeable soil should be increased. In new or existing sites, greater distances to groundwater may be achieved by installing subsurface drains upgradient to the fill. The drains will intercept the groundwater, resulting in lowered groundwater elevations beneath the fill.

The horizontal distance to flowing watercourses should also be increased from 60 feet, in the absence of leachate collection systems, to allow for leachate attenuation through deposition, oxidation and dilution.

Also, sites which drain into ponds or lakes should be prohibited unless leachate collection is provided. The quiescent water, slow re-aeration, and long detention time characteristics of ponds makes them susceptible to oxygen depletion, eutrophication, sedimentation and discoloration due to leachate inflow.

B. Operation

Landfills must now comply with DEQE regulation which specify an engineered method of disposal designed to minimize water quality and public health problems.

The operator of the facility must spread and compact all refuse in less than two foot thick layers at slopes not greater than thirty degrees and must cover each layer with six inches of cover material each day and place an intermediate cover consisting of impervious material on the top and sides of the operation within one month after placing refuse on that portion of the fill. The operator must provide adequate drainage for the fill to minimize infiltration, prevent erosion and the collection of standing water. The completed landfill shall not interfere with the proper drainage of adjacent lands and shall be planted with vegetation to promote stabilization of the cover. The cover should be inspected during the first 12 months following placement of the final cover to discover and correct conditions leading to ponding and/or percolation of water due to cracking. Orders assuring compliance with these regulations may be issued by the commissioner of environmental quality engineering.

Conformance to state landfill regulations has imposed substantial new costs to landfill operations. For new facilities, the initial investment includes the cost of disposal land, planning and engineering, site development, facilities and equipment.

Roughly, one acre of land with a 15-ft. compacted lift of solid wastes will accommodate a population of 10,000 for a year. If additional lifts can be placed over the initial lift, the land requirement can be reduced. Since facility planning is customarily based on a twenty year design life, a small community may require a 20-acre site, not including buffer zones, to meet its solid waste disposal needs. The initial investment for land which may range from \$40,000 to \$80,000 can be recovered in most cases on completion of the site through subsequent use of the land.

Other costs include the following:

- Planning and design costs which vary depending on the size of the site and the level of effort, but should be within \$12,000 for a 20-acre site. Survey and geologic studies may add another \$10,000.
- Litigation and prolonged hearings due to controversy surrounding a site may also be costly and cause long delays.
- Site development costs such as fencing, landscaping, drainage, access roads, clearing and filling are also variable, but may cost in the vicinity of \$25,000.
- Facilities for a 20-acre site include utilities, fire protection, shelter and weight scales. Costs of these items at similar size sites elsewhere were on the order of \$50,000.
- The primary piece of equipment required is a crawler/loader which may be purchased for approximately \$75,000. Larger sites require larger, more expensive equipment.

Actual operating costs of landfills in this region may be inferred by data collected in the Minuteman Solid Waste Region towns. Bedford and Burlington dispose of their refuse at a private landfill for approximately \$10 per ton. Concord and Lincoln hire a private contractor to operate their town landfills and pay \$10 and \$8 per ton, respectively. Boxborough, which operates its own landfill, averages almost \$9 per ton, and Sudbury, which operates a layer facility, spends just \$5 per ton. Estimates appearing in solid waste literature illustrate considerable economies of scale with increasing facility size and tonnage disposed. This is because landfills within a wide capacity range have similar expenses for many fixed cost items such as equipment, utilities, labor, administration, weight scales, access roads, etc. These costs do not increase in proportion to capacity, and therefore decline on a per ton basis with increasing capacity. Regional disposal sites serving several towns could offer substantial savings to member communities over the disposal costs of separate facilities in each town.

Summary of Landfill Operating Costs

<u>Ton/Day</u>	<u>18</u>	<u>33</u>	<u>72</u>	<u>100</u>	<u>250</u>	<u>500</u>
\$/Ton	\$8.	\$5.40	\$4.	\$4.80	\$2.30	\$1.80

While these cost estimates do not assume uniform adherence to the state landfill code, it should be noted that many, if not most, landfills in the region are in violation of some aspect of the regulations. Operation in conformance with the code is, of course, more costly. Perhaps the most common violation is inadequate covering practices. The code specifies that an impermeable cover be applied within one month after placing refuse in a portion of the fill. This practice prevents infiltration of rainwater and surface water into the fill which, in turn, minimizes leachate generation. Despite the importance of this practice to water quality protection, the expense of purchasing and applying a good, impermeable clay apparently discourages this practice.

An alternate impermeable covering practice is being evaluated at a 1,400 ton a day landfill in New Castle County, Delaware. Layers of a polypropylene sheet are used between lifts of milled trash. This system is reported to be one-third as expensive as using imported soil cover, although the need for milling trash will certainly increase the overall expense.

C. Monitoring

A first step in assuring compliance with state landfill operating regulations is an adequate monitoring program to detect surface or groundwater quality degradation due to landfill leachate. Each landfill in the state should be assessed by the DEQE for its likely impact on water resources. Present state inspections are infrequent and inadequate for water quality impact assessment. Site investigations should include collecting all existing information on site geology, soils and water resources.

Site visits should be conducted to determine the leachate generation potential of the site as indicated by its size, depth, age, nature of waste, landfilling procedure and topography of the facility and its surroundings. Sites which do not drain primarily to the subsurface may exhibit visible surface leachate streams.

Based upon the inventory of water resources and leachate generation potential, a preliminary site analysis should be conducted if it appears likely that valuable water resources are being contaminated or could be in the future. This analysis should include sampling of the surface water bodies and existing wells located near the site. Any surface leachate should be sampled and site vegetation should be examined for signs of stress. Surface drainage patterns during a rainfall should also be noted.

Landfill monitoring expenses would range from a few hundred dollars to a few thousand dollars per year depending upon the size of the landfill and the potential threat to public health. The assessment would require approximately five man days per site including search of office files and site visits. A team consisting of a geologist, a civil environmental engineer and a technical assistant would be required to conduct the program within each DEQE district.

If, in the process of field investigation, there is an indication (visual or sampled) of leachate contamination of surface waters, and if information about the subsurface geology indicates a valid need for groundwater monitoring, a monitoring requirement can be made a part of an administrative order. Additionally, where such monitoring showed significant water quality problems, the Division of Water Pollution Control's authority to permit non-point sources of pollution could be used with a permit issued indicating necessary actions to correct the situation and a compliance schedule for the implementation of these measures. Failure to comply with the provisions of the permit could make the owner/operator of the landfill liable for a fine of up to \$25,000 for each day the violation occurs. Monitoring requirements, including the installation of a groundwater monitoring system, could also be required by such a permit.

A minimal system would consist of roughly five, two-inch wells; one well upgradient from the landfill to determine background concentrations, one well within the landfill, and a line of three wells downgradient from the landfill situated perpendicular to the groundwater flow, penetrating the entire saturated thickness of the aquifer. Complex hydrogeologic environments would require

a more elaborate monitoring network. The minimal system would cost several thousand dollars assuming required depths of less than 50 feet. A more complex situation could require a network of monitoring wells costing considerably more.

Where significant water quality problems exist, a number of engineering solutions are generally available to solve the problem and upgrade the facility. It is beyond the scope of this report to discuss these engineering solutions and their cost. If the upgrading of the facility is not cost-effective then the facility should be closed. Closing itself is often an expensive operation generally ranging from \$15,000 to \$160,000. When existing facilities are closed, the community has a number of solid waste management alternatives which it could consider.

D. Regional Options for the Future

Chapter 40, Section 44, subsection A-K, authorizes a city or town, by vote of the City Council or town meeting, to create an unpaid three member regional refuse disposal planning committee. Committee members are appointed by the town moderator or mayor. Two or more town planning committees can then form a regional refuse disposal board. This board is authorized to draw up an agreement setting the terms for the formation of the district, including the organization structure of the regional refuse disposal district committee, the governing body of the district. Capital construction costs are apportioned to the member communities in accordance with the terms of this agreement.

The enabling statute gives the district the authority to purchase or take land by eminent domain; to construct and equip the facilities and to enter into necessary contracts; to incur long-term debt (not to exceed 20 years) and short-term debt grants and gifts; and, to enter into contracts for refuse disposal with non-member cities and towns and other bodies politic, the United States and other persons. The use of this statute to institute regional public landfills may be attractive where regional resource recovery facilities will be unavailable in the near future. Some of the advantages include:

- Elimination of duplication in use of consultants for initial surveys.
- Greater flexibility in locating disposal sites.
- Greater discounts for volume orders of collection and disposal equipment and materials.
- Elimination of duplication of numerous facilities (shelters, utilities, scales) and site preparation items (roads, fences, etc.)
- Coordination of air and water pollution abatement activities.
- Better chance for federal assistance.
- Economies of scale in administration, land acquisition and construction.

In short, regionalization can aid in reducing the unit costs while providing a higher quality operation meeting environmental standards. The larger the

area from within which a site may be chosen increases the opportunities for selection of a site with low potential for water resource impacts without expensive leachate collection and treatment systems.

The Bureau of Solid Waste Disposal (BSWD) within the DEM has proposed a statewide solid waste management plan consisting of three large (3,000 tons/day) regional resource recovery plants and four smaller (1,500 tons/day) plants which would provide statewide coverage by the early 1980's.

Implementation of this plan would take into consideration two privately constructed resource recovery plants - the Resco plant in Saugus and the CEA plant in East Bridgewater. Both plants are expected to handle 1,200 tons/day of refuse with the possible expansion of 3,400 tons/day at the Resco site.

The BSWD is currently sponsoring the implementation of two regional systems. The first, the Northeast Solid Waste Committee project, begun in 1974 in the northeastern section of the state, has gone through regional organization, site selection and system procurement.

The second, the 128 West project in the west suburban area of Boston, is currently in the organization and site selection phase.

The plan recommends that the resource recovery facilities be privately financed, constructed and operated. The BSWD funds the "front end" planning work necessary in assisting the communities in addressing the technical, institutional and financial implementation issues. This includes selection of the most appropriate system technology and the development of operational plans and procedures. In addition, BSWD seeks to determine economically sound regional configurations and to arrange for agreements for the delivery of solid waste to the facility.

These proposals do not require the formation of a district, although a district with limited authority might be formed if it would provide more effective administration. Basically, they call for the establishment of a contractual relationship between the privately-owned and operated disposal facility and each participating community. Financing is carried out under the terms of Chapter 40D, section 21 of the General Laws with bonds being backed by the contracts which bind the communities to deliver a certain tonnage of waste each year.

Implementation activities include organization of the region, site selection, system procurement, contract negotiation and approval, financing, construction and start-up. The BSWD estimates that each regional system will take an average of five years to implement. Judging from the northeast and 128 west regions, this estimate is optimistic. Based on these estimates, implementation of statewide systems is forecast by the BSWD by the early 1980's. It is realized that this timetable hinges on the willingness of communities to join together in a regional approach to solid waste management.

Many MAPC communities face serious problems with respect to future solid waste disposal and the elimination of existing landfill problems. However, the activities of the BSWD in the MAPC area, along with increased emphasis on solid waste disposal and funding for solid waste disposal planning under the Federal Resource Conservation and Recovery Act of 1976 (P.L. 94-580) give every indication that the problems can be, and will be, effectively dealt with in the next few years.

V. ROAD DE-ICING SALT

A. The Problem

The improper storage and the generous application of de-icing salt on highways have been recently identified as the major cause of rising sodium and chloride levels in public water supplies throughout the state. High quality drinking water is an important resource for many MAPC 208 area communities. Unfortunately public drinking water in many parts of the MAPC 208 area has been degraded primarily by runoff draining from highways. Rising chloride levels in surface reservoirs parallel rising annual consumption of salt by the Massachusetts Department of Public Works (MDPW) and local highway departments. Many public wells tapping aquifers beneath the surface of the ground show similar trends. Because water moves far more slowly through an underground aquifer than along a river channel, aquifers do not recover from periodic contamination as quickly as surface reservoirs. Severely contaminated groundwater may not be discovered for months or years after pollutants enter the aquifer. Similar time may be required before natural flushing action again reduces the concentration of pollution to acceptable levels.

Sodium levels have recently taken on greater significance in the assessment of drinking water quality due to the relationship of sodium to numerous human medical problems. Medical authorities advise that patients with congestive heart failure, hypertension, or kidney and liver disease should use water containing no more than 20 mg/l sodium. The necessity to restrict sodium intake for such patients is well documented and not in dispute. However, some medical evidence also suggests that a large part of the population is also affected by similar but undiagnosed health problems, either aggravated or caused by excessive sodium.

In 1970, the Commissioner of Public Health in Massachusetts notified 63 communities that their drinking water supplies contained sodium in excess of 20 mg/l and ordered that appropriate medical officials be notified of this fact. Many MAPC-208 area communities were on this list. At that time no federal or state standard for sodium in drinking water had been defined.

B. New State Regulations

DEQE has recently enacted drinking water regulations for all public water systems in Massachusetts. These regulations were drafted to allow the state to obtain primary enforcement responsibility under the federal Safe Drinking Water Act. As of December 1, 1977 Massachusetts has had this primary responsibility. These regulations set maximum contaminant levels for inorganic chemicals which include sodium concentration standards. While failure to meet this sodium standard does not subject the supplier of water to any enforcement action under these regulations, or require the obtaining of a variance or exemption, it does require the supplier of water to report the non-compliance to DEQE and to notify persons served by the system of the failure to meet the standards, together with an explanation of the reason for the presence of the substance and possible ways of correcting the situation. This notice must be sent at least annually by inclusion with a water bill.

This notification procedure also applies for failure to meet the secondary standard. Secondary standards include maximum contaminant levels for iron, manganese, sulfate and chloride. The maximum contaminant level for chloride

is 250 milligrams per liter. It is likely that many MAPC-208 area communities will not meet these sodium and chloride standards due to contamination from road salting or road salt storage.

Chapter 85, section 7A of the General Laws gives DEQE authority over the stored road salt. DEQE can issue regulations as to how road salt may be stored and may "by specific order, in a particular case regulate the place where such chemicals may be used for such purpose".

It also requires annual reports by persons using more than one ton of snow removal chemicals as to amounts used, by road section, and the amount of chemicals on hand. No regulations have ever been issued implementing this section, and while requests for an annual report are made to municipalities and major known users of road salt no effort is made to compel the submission of these reports. It is recommended that Chapter 85, section 7A be fully implemented. A number of specific deficiencies with current lack of enforcement should be corrected.

- Although the statute requires that all users of snow removal chemicals report annually to DEQE, compliance is far from complete. Many communities fail to respond and those that do often provide incomplete information regarding use, storage and drainage.
- There is presently no money nor staff at the state level to implement the section. Reports once filed, are not verified for accuracy, and potential problems are not investigated or pursued in any way.
- The format of the report is not ideal. Modifications could improve the quality and completeness of the data received.

Specific requirements concerning the storage and use of salt should be promulgated by DEQE, for example:

- Salt should be stored in sheds on impermeable surfaces, e.g., bituminous concrete pads.
- Adequate drainage in the vicinity of the shed should be assured.
- Salt should not be stored in the immediate vicinity of municipal wells, surface waterbodies, or uncovered, or in aquifer recharge areas. Adequate setbacks from waterbodies and covers should be assured.
- All towns should develop maps of local drainage basins and road networks which drain salt-intensive areas; e.g., aquifers, wells, streams tributary to reservoirs and should develop a program of salt use that designates certain sections of roadways to receive: a) sand only, or b) sand/salt mixture. The state DPW should be required to comply with local programs.

It is estimated the recommendations above, with the exception of the development of town maps, could be implemented for under \$30,000/year.

Additionally, a recent act of the legislature provides funds for the construction of salt storage facilities. A sum "not to exceed one million dollars" is available to cities and towns for the construction of salt storage sheds. These funds are administered by the Commonwealth's Department of Public Works. These funds are being allocated to communities having existing problems with road salt contamination. MDC communities will generally not be eligible.

C. Local Salt Control Programs

Public official workshops should be held to educate municipal officials and employees about the benefits and mechanics of a local road salt control program. Such workshops should focus on the following:

- Development of maps showing local drainage basins and road networks with locations of salt sensitive targets (aquifers, wells, streams tributary to reservoirs) as required above.
- Development of a selective application program from such maps that designates specific parts of the road network as no-salt or minimum salt zones, as required above.
- Identification and site-review of snow-dumping areas.
- Training of highway crews both in salt application procedures and posting of signs for safe public vehicle operation.
- Education of local citizens about their responsibility during winter or special driving conditions.

The state DPW is presently planning road salt workshops through their district office. The MAPC could assist in developing and conducting such programs, in line with the recommendations above.

AVAILABLE MAPS

During the course of the MAPC 208 program, a number of maps have been produced containing information on which many project recommendations are based. A list of some of the more important maps follows. The maps were prepared at a scale of 1" = 3,000', a scale suitable for regional level decisions but not one directly applicable to local regulation. The MAPC will make these maps available to member communities for the minimal cost of reproduction. The MAPC also hopes to offer technical assistance to the communities to encourage and assist them to implement the 208 recommendations using the information and concepts presented in the maps. Because many sets of these maps have already been distributed to the communities, you may wish to check with municipal committees/boards or with the MAPC graphics department to determine whether your community already possesses a set. (The maps marked with a check (✓) contain aggregates or comparisons of information on other maps.)

Wetlands

General Soils

Soil Limitations for Septic Systems

Topographic Slope

Groundwater Favorability

Flood Hazard Areas

(✓) Critical and Fragile Areas 1 & 2

(✓) Environmental Pattern

Developed Areas

Zoning Districts

Public and Quasi-Public Land

Landscape Analysis

(✓) Suitability for Development

(✓) Conflicts between Existing Zoning and the Environmental Pattern

Existing Sewer Service Areas and Treatment Facilities

Water Quality Segmentation and Classification

MODELS AND SAMPLES

The MAPC has collected a number of sample and model ordinances, by-laws and other regulations. These are available to member communities contemplating changes in land use or other local regulations. The Council staff is also writing new models and will offer technical assistance to communities on their use. The list which follows outlines some of the areas in which samples and models are available. These models are not all adapted to achieve the water quality purposes outlined in the preceding section, but the Council hopes to complete this in the third year of the 208 project.

Floodplain or Floodplain/Wetlands District
Aquifer Recharge and Protection District
Watershed Zoning District
Cluster Development Regulations
Site Plan Review Procedures
Slope and Erosion Regulations
Growth Management or Phased Growth Regulation
Performance Standards



Section 2.6

**Management
Agencies**

PART II, SECTION 6

208 MANAGEMENT AGENCIES

In this section you will find:

- I. A description of the government agencies which will be responsible for implementing the 208 recommendations, including:
 - A. Municipal Government
 1. Planning Boards/Boards of Survey
 2. Building Inspector
 3. Boards of Zoning Appeal
 4. Boards of Health
 5. Conservation Commissions
 6. Public Works Agencies
 7. Harbor Master
 8. Water Departments
 9. Sewer Departments
 10. Industrial Development Financing Authority
 - B. Regional Government
 1. Metropolitan Area Planning Council
 2. South Essex Sewerage District
 3. Charles River Pollution Control District
 4. Other Wastewater Management Options
 5. Ipswich River Watershed District
 6. Regional Boards of Health
 7. Conservation Districts
 - C. State Government
 1. Executive Office of Environmental Affairs
 2. Department of Environmental Quality Engineering
 3. Division of Water Pollution Control
 4. Metropolitan District Commission
 5. Department of Environmental Management
 - D. Federal Government
 1. Environmental Protection Agency
 2. Corps of Engineers-Department of the Army
 3. Soil Conservation Service - Department of Agriculture
 4. Department of Housing and Urban Development

I. THE EXISTING AGENCIES

The local, regional, state and federal institutions responsible for the implementation of the various solutions in Part I of this draft Areawide Plan are described below. Because 208 areawide planning calls for the development of an immediately implementable plan, currently functioning management agencies are to be preferred and strengthened whenever possible. The new potential institutional forms noted in this section are limited to those believed necessary to improve the administration and coordination of water quality control functions in metropolitan Boston.

A. Municipal Government

Municipal government in Massachusetts has broad authority to provide services and exercise control over various activities. This authority is derived from state statutes and the "Home Rule Amendment", (Amendment Article 89) which creates a "residual powers" concept, enabling municipalities to exercise broad authority with respect to local affairs which have not been addressed by state enabling legislation. When specific enabling authority cannot be cited, the question of whether these functions would be authorized under the concept of "Home Rule" must be considered.

According to Chapter 83, section 23 of the General Laws cities and towns may assume part or all of the cost of laying out and constructing main drains or systems of sewage disposal, and when less than the whole cost is assumed, the balance may be assessed in any manner allowed under other provisions of law. The city or town has authority to assess on sewered properties the "proportional part" of making and repairing sewer connections, and the charge, not already assessed, of constructing and repairing the main drains and common sewers pursuant to Chapter 83, section 14. Generally, municipalities raise money to pay sewage system costs by:

- 1) betterment assessments based on property frontage and depth along the routes of sewer mains (G.L.C.83 S.15)
- 2) a "sewer privilege tax" which is a "reasonable amount" as determined by the aldermen, selectmen, sewer commissioners or road commissioners (G.L.C.83 S.17)
- 3) "... just and equitable annual charges for the use of the common sewers, which shall be paid by every person who enters his particular sewer therein. The money so received may be applied to the payment of the cost of maintenance and repairs of such sewers or of any debt contracted for sewer purposes (G.L.C.83 S.16)

Additionally, the owners of land not liable to assessment, or not in fact assessed, may use the common sewers for the disposal of their sewage only upon payment of a reasonable amount as determined by the aldermen, selectmen, or sewer or road commissioners, according to Chapter 83 section 20 of the General Laws.

It should be remembered that sewage system costs not borne by one of the methods noted above or by state or federal grants must be financed from local property tax receipts. This, of course, is true for all municipal expenses not otherwise financed through charges or fees authorized by statute.

1. Municipal Government - Planning Boards/Boards of Survey. Boards of Survey were predecessors of planning boards, and for towns which created them prior to 1936, they have continued to function except if planning boards have been subsequently established. Boards of Survey are automatically terminated if a planning board is created. They can no longer be created, but were formerly created by choice of the municipality.¹

Every town with a population exceeding 10,000 must have a planning board and smaller towns may elect to have one. Planning boards are either elected at town meeting or appointed by the selectmen. The choice as to method of appointment is up to the approval of the aldermen or city council.² Planning boards have the following powers:³

- a) Assume the powers of a Board of Survey:
- b) Make studies and prepare plans of the resources, possibilities and needs of a city or town and to submit reports with their recommendations;
- c) To approve subdivisions;
- d) File reports with the city council or town meeting on all proposed changes in the local zoning law;
- e) To act as the special permit granting authority, if authorized by the local zoning ordinance;
- f) To act as park commissioners when authorized by vote of the town meeting;
- g) To make master or study plans of the city or town or parts thereof which the board deems advisable.

This list of powers would appear to make the planning board an important local actor in water quality management. The authority to make plans for the community and to comment on zoning changes would appear to give the board real power in planning for and controlling local growth in a manner consistent with water quality. However, often these plans are outdated or simply not referred to when capital improvement or general development decisions are made. The timing of these improvements, or their quantity is often beyond the power of the planning board. The community is not bound by these plans so that development or capital improvement decisions made by other boards and town meetings are often influenced by factors other than planning board studies or plans, particularly when the issue is controversial.

Planning boards usually consist of part-time citizen members and often there is little or no professional support staff. This further hampers the ability of a planning board to deal effectively with the complex and technical issues of long-range community planning.

Planning boards do have real power in their role in approving subdivisions and now in their ability to function as the special permit granting authority for zoning approvals. Under this special permit granting power, largely untested at this point, planning boards could function very effectively in granting permits for PUD, cluster developments and other special permit cases consistent with a local water quality management plan, or, in the absence of a local plan, with the areawide water quality management plan.

Finally, it should be noted that since planning boards are either elected or appointed, they particularly are accountable to the citizenry they serve. While this enables them to be representative of community goals, it also makes them very susceptible to local political pressure which can often be unrepresentative of general community concerns, and often at odds with sound community planning. This is, of course, a problem, to varying degrees, at all levels of government.

2. Municipal Government - Building Inspectors. Building inspectors carry out a number of ministerial duties including the issuance of building permits, the enforcement of state laws relating to fire prevention, and the inspection of dangerous buildings. The most relevant authority with respect to water quality management is the role of the building inspector as enforcer of the zoning bylaw or ordinance and the ability to withhold permits for the violation of a zoning bylaw.⁴ As a building inspector is generally the first person notified of proposed construction, his determination as to whether a proposed use required detailed site review, a special permit or a zoning variance is critical. The most innovative zoning ordinance drafted to provide maximum protection of water quality will not be effective if it is not understood by the building inspector. If such innovative ordinances are adopted, it is important to ensure that the building inspector understands their procedures and purposes.

3. Municipal Government - Boards of Zoning Appeal. Boards of Appeal currently exercise considerable power in local land use matters due to their general administration of local zoning ordinances. They are appointed by the mayor,⁵ subject to confirmation of the city council or the board of selectmen. The Board of Appeals has the following powers:⁶

- a) to hear and decide appeals by any person unable to obtain a permit or enforcement action, by the regional planning agency, or by any person aggrieved by an order or decision under the Zoning Act.
- b) to hear and decide applications for special permits upon which the board is empowered to act under the zoning bylaw (the Board of Appeals is no longer the only local body with the authority to grant special permits).

- c) to hear and decide petitions for variances.
- d) to hear and decide appeals from decisions of a zoning administrator, if any (the board of appeals, if authorized by the zoning bylaw may appoint a zoning administrator and delegate some of its powers and duties to him).

The power to grant discretionary special permits and to grant variances can be used to effectively administer an ordinance in a flexible manner which can balance environmental, social and economic concerns. It can also be used to bypass legitimate environmental concerns, and to grant such permits and variances more in response to a variety of local sympathies and pressures than the protection of water quality. The special permit granting process is, in itself, an effective land use control tool which has not been used extensively, to date. The increased emphasis on it in the new zoning act and the expansion of possible special permit granting bodies will undoubtedly make special permit bylaws a politically "hot" issue in the next few years. The element of political power-grabbing involved may somewhat subvert the intent of the statute.

4. Municipal Government - Boards of Health. With respect to local water quality-related controls, boards of health exercise considerable power. Members of the board are elected by the voters in towns, with selectmen otherwise able to serve as a board, and the board is generally appointed by aldermen or the city council unless otherwise provided in the city charter.

Local boards of health are charged with enforcement of Title 5 of the State Environmental Code, and can impose more stringent regulations when local conditions require them.⁷ They may make and enforce regulations relative to house drainage and connection with common sewers.⁸ They assign sites and monitor the operation of any "sanitary landfill, a refuse transfer station, a refuse incinerator, a refuse composting plant, a dumping ground for refuse or any other works for treating or disposing of refuse."⁹

They may examine and destroy, remove or prevent nuisances, including those which affect the public water supply.¹⁰ They regulate private and semi-private water supplies.¹¹ They may assign locations where offensive trades or employment which may result in a nuisance, be harmful to the inhabitants or dangerous to the public health can only be carried on,¹² and they make "reasonable health regulations", including regulations on sewage disposal and regulations necessary to remove or prevent nuisances.¹³ As has been noted previously, local boards of health also play an important role in the subdivision approval process.

Considering the scope of their authority, local boards of health can play a significant role in the wastewater management system. However, the extent to which they can effectively and efficiently carry out their duties in a manner which will further water quality goals is unclear. Insufficient resources and a general unwillingness to take steps to promote water quality could be fatal to local implementation of a water quality management plan. Local boards very often have limited staff to carry out

their duties with respect to public health and environmental protection with little regard to conflicting social and economic considerations. The relative ease with which they can adopt regulations (regulations adopted by the board become effective after publication, once, in the newspaper of the town)¹⁴ does not provide for much input by affected individuals and groups but does, of course, provide for more efficient administration. At the same time this method of adopting regulations puts a serious strain on the budgets of many boards of health. The requirement for publication of regulations in toto (not just a notice of rulemaking) can often be quite expensive, and, where resources are limited, can effectively impede the development of detailed and comprehensive regulations.

5. Municipal Government - Conservation Commissions. Local conservation commissions are established "for promotion and development of the natural resources and for the protection of watershed resources" of the city or town. They may develop conservation and passive outdoor recreation plans for the community, and may acquire by gift, purchase, grant, bequest, devise, lease or otherwise the fee in land or water rights for conservation purposes, or any lesser interest, development right, easement, covenant, or other contractual right in such land. They may also take land by eminent domain.¹⁵

Under the Wetlands Protection Act,¹⁶ local conservation commissions (or, if there is none, the board of selectmen in towns or the mayor in cities) and the Department of Environmental Quality Engineering within the Executive Office of Environmental Affairs share authority for the review and regulation of a variety of development activities in inland and coastal wetland areas. A person intending to remove, fill, dredge or alter" a wetland must file a notice of intention with the local conservation commission which, if it determines that the area of the proposed work is "significant to public or private water supply, to the groundwater supply, to flood control, to storm damage prevention, to prevention of pollution, to protection of land containing shellfish, or to the protection of fisheries", is mandated to issue a written order imposing conditions on the work. In the event of unsatisfactory action or failure to act on the part of the conservation commission, an aggrieved party (including the applicant, abutters or 10 residents of the municipality) or the Commissioner of DEQE can request a new determination of significance and order of conditions from DEQE. The Commissioner has authority to promulgate rules and regulations to "effectuate the purposes of this section". Final orders are recorded with the property's deeds in the appropriate Registry of Deeds and are binding upon subsequent owners of the property.

With respect to their planning functions, conservation commissions generally function as a form of specialized planning commission whose views and policies are generally advisory, and must rely on other decision-makers within their communities for implementation of these plans. Community recreation and conservation plans should be developed to not only meet state and federal requirements for open space and recreation land acquisition programs (The Self-Help Program and the Land and Water Conservation Fund), but also to identify other natural resource protection goals and priorities for the community, including implementation activities consistent with 208 plan recommendations. The Soil Conservation Service currently has a program

(The Natural Resources Planning Program) which can assist communities with this community specific natural resources planning. The MAPC is working with the SCS to gear this program towards meeting recreation and conservation plan requirements and 208 plan recommendation.

As a local regulatory agency, conservation commissions are often faced with severe manpower constraints. Because of the scope of their jurisdiction, they must be familiar with such varied disciplines as engineering, hydrology, biology and law. While many conservation commissions have technically skilled members, some lack the technical ability to review permit requests in a technically competent manner. This often creates ill feelings and an unproductive working relationship between the commission and the permittee. This, in turn, often prompts noncompliance with the order of conditions. While the commission may take many enforcement actions on their own with little or no outside assistance such as the issuance of Requests for Compliance or Cease-and-Desist Orders, once court action is required to get compliance commissions often run into problems. In a court action, the commission is represented by either the Town Counsel, City Solicitor or a Special Counsel retained for the case. Since the hiring of outside counsel must be approved by the selectman or City Council/City Manager, it is unlikely that this course would be available except in the most severe circumstances where significant community issues were involved.

Commissions often have difficulty in getting the town counsel/city solicitor to take action. The town counsel is frequently occupied with more traditional workload demands such as municipal labor relations and eminent domain proceedings and the work of other boards with more traditional powers and broader jurisdictions. Occasionally, the town counsel/city solicitor must choose between the position of the commission and other town boards. Commissions can bring action under the citizen suit statute,¹⁷ or directly, or through DEQE, ask the Attorney General to take action. Here again, limited government resources may restrict the use of these alternatives.

Conservation Commissions are often accused of being over-zealous in their application of the wetlands act, and in the failure to consider other social and economic factors in the exercise of their authority. It is impossible to accurately assess this complaint. The commissioners are appointed (by the mayor, selectmen or manager) and are therefore politically accountable to some extent. Local growth policy statements generally do not reflect the concern of development oriented interest groups of over-regulation in this area.

6. Municipal Government - Public Works Agencies. Under the public works law¹⁸, towns may elect to consolidate the functions performed by the road commissioners, surveyors of highway, superintendents of streets, water commissioners, sewer commissioners, municipal light commissioners, park commissioners, tree wardens and forestry departments into a board of public works consisting of three elected members. This board can also assume other public works type of activities including engineering planning and services and refuse disposal.

These boards could do much to assist in the development and implementation of a local water quality management plan through their direct involvement in many water quality-related municipal capital improvements. It does not appear that they have been used extensively for this purpose. Because they are elected and their jurisdiction is quite extensive, they appear to offer the good opportunities at the local level for an effective component of water quality administration which is politically accountable.

7. Municipal Government - Harbor Masters. Harbor masters are appointed by the mayor in cities (except in Boston where the appointment is by the police commissioner), and are appointed by the selectmen in towns. They make regulations regarding the anchoring and moving of boats in a harbor and serve as enforcement officers for local ordinances regarding harbor use, including streams and channels within the harbor.¹⁹

Local ordinances regarding speed limits in order to reduce shoreline erosion or local water pollution related ordinances can be enforced by the Harbor Master. Where they exist, and subject to local jurisdiction, Harbor Masters can be effective enforcement officers.

8. Municipal Government - Water Departments. Town water departments are controlled by a board of three water commissioners, who are elected, after a determination by town meeting to establish such a commission.²⁰ Otherwise, cities and towns may purchase or contract water according to the provisions of Chapter 40, section 38 of the General Laws.

Water commissioners have "exclusive charge and control of water department and waters system",²¹ including the power to take by eminent domain water and land necessary for water supply and the protection of such water supply. The utilization of this authority to purchase certain development rights and other lesser fee interests related to aquifer protection has not been considered to any great extent in the area.

9. Municipal Government - Sewer Departments. At the municipal level, wastewater treatment works and collection systems can be controlled by a number of government entities, including sewer commissions or boards consisting of three elected commissioners,²³ or the board of selectmen acting as the sewer commission or board and delegating its authority to a local sewer or public works department.²⁴

Chapter 83, section 1 of the General Laws authorizes a city or town to:

"lay out, construct, maintain and operate a system of common sewers and main drains...as they adjudge necessary for the public convenience or the public health...Such works for sewage treatment and disposal may include any wastewater treatment facility for treating, neutralizing or stabilizing sewage including treatment or disposal plants; the necessary intercepting, outfall and outlet sewers; pumping stations integral to such facilities; and equipment and appurtenance related to the foregoing."

Under Chapter 83, section 10 of the General Laws a city or town may prescribe "rules and regulations regarding the use of common sewers to prevent the entrance or discharge therein of any substance which may tend to interfere with the flow of sewage or the proper operation of the sewerage system..." Additional authority can be found in Chapter 40, section 21(6) which allows towns to "make such orders and bylaws, not repugnant to law...for regulating, under a penalty not exceeding fifty dollars for each offense, the use of common sewers..."

The financing of wastewater facilities is carried out under general municipal financing authority. As town meeting must approve expenditures of funds and the adoption of ordinances and bylaws, and the commissioners are elected, the local administration of sewers can be said to be particularly politically accountable. However, the control of treatment facilities and control of collection systems are often carried out by different departments. While this system would seem prone to ineffective administration, no examples can be cited. The enforcement of local ordinances has not created major problems at the local level. Flagrant violations are usually remedied through informal mechanisms. The existing ordinances are generally not detailed enough to permit the stringent monitoring and enforcement envisioned in federal pretreatment guidelines.

The coordination of sewer system planning with land use planning has not generally been done at the local level. It is only recently that the secondary impacts of sewerage have been recognized by communities, and the possibility for controlling these secondary impacts through coordinated planning and control noted.

10. Municipal Government - Industrial Development Financing Authority. An Industrial Development Financing Authority can be established in a community by a vote of the city council or town meeting.²⁵ It is composed of five members, one experienced in financial matters, one in real estate, one in town or city government, and two other appointed local residents. The IDFA has authority to process and negotiate applications for industrial development revenue bonds. IDRB's are tax-free municipal bonds used for financing industrial expansion and pollution control. They are issued on the credit of the industrial tenant and such security as he might furnish. The municipality does not pledge its faith, credit or financial obligation to an IDRB. A prerequisite for IDRB financing in a city or town is the establishment of an Industrial Development Financing Authority. The IDFA may then, with approval of the governing body of the municipality and the State Industrial Finance Board, enter into contracts to finance pollution control facilities through IDRB's. In order that a bond issue for pollution control be approved the State Industrial Finance Board must find that:

- 1) Such a project will alleviate unemployment or the threat thereof in the municipality or provide security against future unemployment and lack of business opportunity in the municipality;
- 2) A substantial public benefit will result from the project;
- 3) DWPC has found that it is in furtherance of the purpose of abating or controlling water pollution.²⁶

The municipality, through its IDFA, issues the IDRB and transfers the bond proceeds to a corporate trustee who makes the funds available to the company to construct the facility. The municipality retains title to the property until the bond issue is fully paid. The project is then leased (or sold through an installment sale) to the manufacturer who then makes payments over a period of time to cover repayment of the bonds, interest and carrying charges of the bond issue. When the bond issue is retired, title is transferred to the company.²⁷

The cost to the Treasury in lost tax liability through IDRB's was about \$500 million in 1976.²⁸ In general, this financing method is inefficient and inequitable with the benefits going largely to companies which install pollution control equipment and the holders of tax-exempt bonds.

Industrial Development Financing Authorities can also be used in financing the construction of solid waste disposal facilities,²⁹ as long as the project is consistent with "state plans for the conservation of natural resources".

B. Regional Government

While there are some 65 existing regional entities in the Boston metropolitan area only a few of these are involved in various aspects of water quality management. This arrangement provides critical links in coordinating water quality management plan certification with land use, transportation and economic development. This section will briefly survey the sources and limits of the authority of these institutions and describes their role in water quality management.

1. Regional Government - Metropolitan Area Planning Council. The MAPC was formed in 1963 as a logical outgrowth of the cities' and towns' needs to pool their resources in coping with problems associated with rapid growth, as well as with increasing public demands for improved local and metropolitan services. It is a public agency established by statute³⁰ and is responsible to its 101-member communities through the chief elected official of the local government. Its operating budget is derived from a per capita assessment on these cities and towns, as well as through grants received from the federal and state government.

It is at this level that the official sign off on behalf of the region by a consensus of local officials is given to:

- 1) the regional transportation plan making the area eligible for federal dollars;
- 2) the regional economic development plan making most of the area eligible for federal dollars;
- 3) the regional housing and land use planning effort making MAPC eligible for federal dollars and affording the region opportunity for effective phased growth management;
- 4) the 208 water quality management plan;
- 5) other such areas of regional planning as become appropriate.

Coordination and implementation can be monitored at this level during the annual updating process and during A-95 reviews of various projects.

The Council is made up of the chief executive officer or a designee from each member community; the heads of 11 local, regional and state agencies; and 21 gubernatorial appointees bringing the total membership to 133. While the full Council meets usually three times yearly to collectively formulate and act upon plans, studies and policy positions, the 24-member Executive Committee generally controls the on-going operations of the Council. The Executive Committee consists of the president, vice president, secretary, and treasurer of the Council, five representatives from the towns, five from the gubernatorial appointees and five from the ex-officio members. These persons are elected by the Council.

The Council is authorized to enter into contracts and agreements with any department, agency or subdivision of the federal or state government and any individual, corporation, association or public authority to provide or receive services, facilities, staff assistance or money payments in connection with the work of the Council and the Council may contribute or receive services, facilities, staff assistance or money payments as consideration in such contracts and agreements.

The MAPC is, of course, now involved in the 208 planning effort which considers to a much greater extent the interrelationship between land use and water quality management and the growth implications of sewerage.

In terms of political accountability the structure of the Council, along with the formation of a number of advisory committees allows for multiple access points into the policy-making process for interested citizens and groups with ultimate accountability resting with the chief elected local official.

The Council does possess a fairly comprehensive subject matter jurisdiction so that broad social, economic and environmental issues can be addressed both in planning and policy making. While the Council has powers to vote "regional certification plans" that lead to implementation dollars, and powers to review local plans for consistency, a key element of the legislation is that it respects home rule rather than mandating another layer of bureaucracy. The Council can and has implemented plans within sub-regions; but only with the full participation and cooperation of local governments. The Council role is to provide technical assistance and brokering services to negotiate regional solutions respectful of home rule desires.

2. Regional Government - South Essex Sewerage District. The South Essex Sewerage District was established in 1925 by a special act of the state legislature (Chapter 339 of the Acts of 1925). The SESD originally comprised the municipalities of Beverly, Danvers, Peabody, Salem and state and county institutions located in Danvers and Middleton. In 1972, by special acts, the town of Marblehead became a member and portions of Middleton were included in the district. In 1974, special state legislation authorized the City of Beverly to contract with Gordon College for sewage disposal, such sewage eventually being discharged by Beverly to the SESD. (The contract authorized by the special act was subject to the approval of the South Essex Sewerage Board.)

The SESD is managed by the South Essex Sewerage Board. The Board is comprised of a chairman, appointed by the Governor, the Commissioner of Public

Works from Beverly, the Director of Public Services from Peabody, the city engineer from Salem and representatives from Danvers and Marblehead. There is also a treasurer and clerk for the SESD, elected annually (one person may hold both offices), and the board is authorized to employ such engineers, experts, agents, officers, clerks and other employees as it deems necessary. The board is authorized to construct, maintain and operate such works as required for the system and has the power to enter into contracts and other arrangements as necessary to construct the system and carry out its duties under its enabling authority.

Generally, a special act is passed by the legislature for work involving the construction, reconstruction or rehabilitation of the various components of the system. These acts usually specify the work to be done and the method of apportioning the costs of such work. They also authorize the treasurer, with the approval of the board, to incur both short and long-term debt, and they authorize the board to apply for grants from the federal and state governments. Chapter 516 of the Acts of 1969 is such an act, providing for the construction of new and enlarged intercepting sewers, sewage treatment facilities (primary), pumping stations and other works for the SESD. The construction costs for certain intercepting sewers and pumping stations serving individual communities are assessed to those communities. The costs of construction of the sewage treatment facilities and the outfall sewer are apportioned as agreed to by the communities and institutions based on a capital cost allocation formula utilizing the design parameters of flow, suspended solids and chlorine demand. (For more detailed information on this subject see "Report to South Essex Sewerage District on Industrial Cost Recovery and User Charges", October 21, 1976 by Metcalf & Eddy, Inc.)

In 1975, the method of determining the annual apportionment of the cost of maintenance and operation of the SESD was changed by Chapter 101 of the Acts of 1975. Previously, both the cost of construction and operation and maintenance costs were apportioned as follows: one-third in proportion to respective valuation (as determined by the Commissioner of Corporations and Taxation) and two-thirds in proportion to respective normal average flow of sewage. Since the passage of Chapter 101 of the Acts of 1975, operation and maintenance costs are apportioned "in proportion to their respective flow of sewage as determined by said board for the previous year". Payments due for the retirement and interest payments falling due on bonds or notes issued for construction costs, except for those improvements provided for by Chapter 516 of the Acts of 1969 (noted above), continue to be apportioned one-third in proportion to respective valuations and two-thirds in proportion to respective normal average flows of sewage.

Under the provisions of Chapter 339 of the Acts of 1925, as amended by Chapter 384 of the Acts of 1935, the South Essex Sewerage Board has control over the sewers, pumping stations and their appurtenances belonging to the District. The board "shall prevent, so far as practicable, the discharge into the sewers of substances which may cause obstruction therein or impede the flow of sewage", and "shall for the proper and reasonable operation of its works make regulations as to the character of any sewage, drainage or other wastes discharged into any sewer tributary thereto and may, if it deems it necessary and desirable for the proper and reasonable operation of the works, make regulations governing the rate of discharge of any such sewage, drainage or other wastes..." The Board has the right to enter any premises which are connected to the system to determine the condition of the sewer, drain, tank or treatment works and the character of the sewage, drainage or other wastes. The Supreme Judicial Court has jurisdiction in equity to enforce the provisions of the District's enabling act or regulations made under it.

The South Essex Sewerage Board adopted "Sewer Use Regulations" on September 14, 1972 which controls the use of the public sewer, including the prohibition of certain substances and types of waters or wastes, and gives the authority to require pretreatment; control the quantities and rates of discharge; require payment for added costs in handling and treating wastes; or reject the wastes. Any person violating the regulations can be found guilty of a misdemeanor and subject to a \$20 fine for each day the violation continues (\$20 fine is authorized by Chapter 83, section 10 of the General Laws), as well as being liable to the District for any expense, loss or damage occasioned by the violation.

The legal authority of the SESD to effectively control its system is somewhat limited due to the limitations of its control over local collection systems and individual discharges. It is, however, compatible with the governmental style of the area with its strong reliance on local autonomy.

The limited scope of the SESD's subject matter jurisdiction, primarily concerned with sewerage, constrains their consideration of other environmental, economic and social objectives in their policy making. Opportunity for citizen input is also limited. The necessity to go to the legislature for approval of major projects does add a measure of political accountability into the management structure, but it appears that this is more political accountability in form rather than substance. Finally, communication between the SESD and affected individuals and groups appears to be limited. On the positive side, the District seems to have sufficient trained staff to carry out its wastewater management functions.

3. Regional Government - Charles River Pollution Control District. The Charles River Pollution Control District was established in September, 1973 according to the provisions of the Mass. Clean Waters Act.³¹ Pursuant to that Act, the Division of Water Pollution Control, with the approval of the Water Resources Commission, proposes the formation of such a district. The proposal must then be considered by town meeting. If the town meeting rejects the proposal, the director of the DWPC may then hold a hearing, and at the completion of the hearing if the director finds that the creation of such a district is "necessary for the prompt and efficient abatement of water pollution", he may, with the approval of the Water Resources Commission, declare the mandatory formation of the district. The CRPCD was voluntarily formed. As a voluntarily formed district, it is controlled by a Board of Commissioners consisting of four members, two each from Franklin and Medway, the two towns currently composing the district. The CRPCD does not currently have operating facilities, but a wastewater treatment plant and interceptor sewers are under construction and are expected to be completed in the spring of 1979. A user charge system for the District is currently being planned.

An institutional evaluation of the district would be premature at this point as the district is not yet fully operational.

4. Regional Government - Other Wastewater Management Options. In addition to the existence of the regional wastewater management agencies noted above, a number of communities, based upon the community specific recommendations of this plan, will have to consider an intermunicipal approach to wastewater management. There are basically three possible intermunicipal management forms available under Massachusetts law. They are the intermunicipal sewer service agreement, the pollution abatement district and the special district.

A number of intermunicipal sewer service agreements currently exist in the MAPC-208 area (Marlborough-Northborough; Lynn-Nahant-Saugus; Marshfield-Duxbury) with a few other presently being considered. Intermunicipal sewer service agreements are authorized by Chapter 40, section 4A of the General Laws which allows cities, towns or districts to perform jointly, or for such other unit any service, activity, or undertaking which it is authorized by law to perform. In terms of having the authority required by section 208(c)(2) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) for designated management agencies, reference should be made to the authority of the individual local governments. In drafting such an agreement careful consideration should be given to the requirements of Section 208(c)(2). It should obligate each community to enforce the federal requirements for user charges, industrial cost recovery, sewer system rehabilitation and sewer use ordinances. In addition, average daily flow rates should be set with provisions for peak flows and financial arrangements which allocate capital costs and annual operation and maintenance costs (in proportion to flow rates and strength as it relates to treatment costs). An administrative overhead charge provision may also be appropriate.

The formation of a special district would be by means of a special act of legislature. The district would then be a government entity separate from its member communities. It's only powers and duties would be those conferred by the legislature in the special act. Therefore, in drafting the legislation for such a district care would have to be taken to insure that the designated management authority requirements of section 208(c)(2) were included within the scope of powers in the district. Despite the provisions of the home-rule amendment to the Massachusetts Constitution (amendment article 89) and "even though such action may have special effect upon one or more individual cities or towns...sewer systems, with their effect on water quality in a particular area, are a matter of state, regional or general concern, and thus an area in which the Legislature retained law-making authority."³²

The third alternative for intermunicipal management of wastewater treatment facilities would be the establishment of a water pollution abatement district pursuant to chapter 21, sections 28-36 of the General Laws. Such a district would have those powers and duties set out in the statute. The Division of Water Pollution Control, with the approval of the Water Resources Commission, proposed the formation of such a district. The proposal must then be considered by town meeting. If the town meeting rejects the proposal, the director of the DWPC may then hold a hearing, and at the completion of the hearing if the director finds that the creation of such a district is "necessary for the prompt and efficient abatement of water pollution", he may, with the approval of the Water Resources Commission, declare the mandatory formation of the district. As of this date this provision has not been used to mandatorily form a pollution abatement district, but the threat of its being invoked is probably sufficient incentive for communities to voluntarily form districts when necessary. In a mandated district, the district commission consists of three members appointed by the DWPC director, while voluntarily formed districts are controlled by a district commission consisting of two members, at a minimum, from each community, selected by the Board of Selectmen or City Council.

A pollution abatement district must present to the division, within one year or whatever time period the division may prescribe, a plan for the abatement of water pollution which must identify the sources of pollution in the district

and the means by which and the extent to which such pollution is to be abated. These provisions are generally aimed at meeting the requirements of Section 201 of the Federal Water Pollution Control Act, in terms of facilities planning. Once the DWPC approves such a plan for abatement it shall direct the district to apply for federal funds, and the DWPC may itself make a grant to the district equal to fifteen percent of the eligible project costs. A district's local share of capital costs can be financed either by municipal appropriations or by general obligation bonds, backed by the credit of the individual municipality, but such indebtedness shall not be included in computing the limit of indebtedness of any city or town.

In evaluating the appropriate management option at the local level the factors noted above (cost, political acceptability, management feasibility and equity) should be considered. At the regional level the primary question is what management form best serves the needs of the region in a cost-effective and responsive manner. An additional concern is whether the available management alternatives can meet the requirements of section 208(c)(2) for designated management agencies. (See Part I, section 1.)

5. Regional Government - Ipswich River Watershed District. In 1966 the Ipswich River Watershed District was established by special act of the Legislature (Chapter 682 of the Acts of 1966). This district includes the communities of Andover, Beverly, Boxford, Burlington, Danvers, Essex, Gloucester, Hamilton, Ipswich, Lynn, Lynnfield, Manchester, Middleton, North Andover, North Reading, Peabody, Reading, Rowley, Salem, Topsfield, Wenham and Wilmington. There is a district advisory board with a representative from each community and each water district within the watershed district, as well as a number of non-voting ex-officio members. The district is under the direction of a commission of five members appointed by the advisory board. The commission is charged with investigating available water resources for the district and methods of preserving and increasing such resources, as well as investigating all pertinent matters relating to the quantity and quality of water required. A report on water supply and the Ipswich was prepared for the Water Resources Commission and the District in 1971.

The watershed commission is funded annually by the General Court in its appropriations to the service of the Division of Water Resources within the Dept. of Environmental Management. The amount of funding is generally small, depending upon the program to be undertaken by the commission during the upcoming fiscal year. For example, while the commission was authorized to spend \$54,500 in fiscal 1975, only \$1,000 was authorized in fiscal 1976. The state appropriation act provision usually directs the State Treasurer to assess the costs incurred by the commission in one fiscal year upon the member communities in the following year. Of that assessment, half is apportioned in proportion to the state-equalized property valuations of member communities, and the remaining half in proportion to their respective populations. While the scope of the District's authority is sufficiently broad to enable it to effectively consider related environmental, economic and social considerations the District has no real management authority, nor does it possess adequate funding or staff to expand its activities. A reconsideration of the role of this type of institution is appropriate in terms of effective water quality management.

6. Regional Government - Regional Boards of Health. Section 27A of Chapter 111 of the General Laws allows two or more towns, by vote of each,

to "form a district for the purpose of employing therein a health officer and necessary assistants and clerks..." A joint committee of the boards of health of each participating community determine the duties and compensation of the health officer and other staff, with each paying a proportional amount of the costs. A town may withdraw from such a district by vote of the town. This section does not apply in Barnstable County or to any city in the Commonwealth.

In the Ipswich River and North Coastal Basins there are two existing regional health districts formed under the provisions of section 27A of Chapter lll. These are the Hamilton, Essex, Manchester Regional Health District, and the Boxford, Topsfield, Wenham Regional Health District. Each employs a full-time professional sanitarian, who works closely with the boards of health of each member community in enforcing state sanitary and environmental codes and local health regulations. Because the health agent must work with the varying local health codes of each member community, and works more with the local board of health than the regional board (at least this appears to be the situation for the Hamilton, Essex, Manchester District), this institutional set-up appears more akin to the joint employment of a professional health agent than the creation of a truly regional institution.

In the SuAsCo Basin there is one existing regional health district which includes only one MAPC community. The town of Littleton contracts with the Nashoba Associated Boards of Health for the services of a health agent for the town. The Nashoba Associated Boards of Health is also a regional health district formed the provisions of section 27A of Chapter lll. Again, this institutional arrangement appears more akin to the joint employment of a health agent than the creation of a truly regional body. Of course, it facilitates coordination and consistency among neighboring boards of health and provides an administrative set-up which is easy to work with in terms of assessing costs to member communities, while minimizing impacts on local autonomy. However, there is no assurance that regional concerns, if they conflict with local interests, would be adequately considered.

Financing for the Nashoba Regional Health District and for all regional health districts formed under Chapter lll, section 27A of the General Laws is by the joint committee determining, in December of each year, the amount of money necessary to fund the District budget for the following year, and the proportion thereof to be contributed by each member town according to the cost sharing formula agreed upon by the committee. The amount required from each town is then certified to its board of assessors for inclusion in their local tax levy, and payment is made to the District Treasurer. The Nashoba Regional Health District determines local contributions on a per capita basis.

A variation of this prevailing form of regional health district is the Needham-Wellesley-Weston Cooperative Boards of Health. This institution was formed in 1956 under the authority of Chapter 40, section 4A of the General Laws which, while not addressing itself directly to regional boards of health, states that:

"any governmental unit, as herinafter defined, may enter into an agreement with one or more other governmental units to perform jointly or for such other unit or units, any service, activity or undertaking which each contracting unit is authorized by law to perform, if such agreement is authorized by each party thereto..."

The member communities (Needham, Wellesley, Weston) jointly employ the director of public health whose salary is paid by a per capita assessment on each community. Wellesley and Weston share the services of a sanitarian and clerical help, and each community employs a nurse. These shared employees are considered to be employees of the town of Wellesley. Needham employs its own sanitarian, nutritionist, nurses and clerical help.

The staff generally works with each local board of health. The cooperative board, made up of all of the local health boards, meets periodically. Health regulations are set by each local board. The cooperative arrangement was originally established in order to provide professional public health services to the communities at the lowest cost possible, utilizing economies of scale. This continues to be the major advantage of the arrangement, along with the facilitation of health program planning. Infringement on local autonomy, seen by some as the major disadvantage, does not, in reality, exist, as the local board of health is the ultimate decision maker.

A more comprehensive enabling statute for regional health districts appears in section 27B of Chapter 111. It allows two or more municipalities (town, city or city with a Plan E charter) to vote to form a regional health district, which must be administered by a full-time director of health, and which shall have all of the powers and duties of the boards of health of constituent municipalities, except for powers and duties which the district may delegate to the constituent communities.

The regional board of health under section 27B must have at least one representative from each community, with each community with a population of over 10,000 having one additional representative for every population unit of 10,000 beyond the first 10,000. However, no municipality may have more than five representatives. These representatives may be either elected or appointed. Where the district includes one or more entire county the county commissioners shall appoint a county representative to the district. Each municipality in the district must pay its proportional share of the cost and expense of the district. This proportion may be determined by valuation, population, or "any other method decided by majority vote of the board". The regional board of health may promulgate reasonable rules and regulations. However, the regional health district is held to a higher procedural burden than a municipal board of health in adopting rules and regulations, for it must give public notice and hold a hearing pursuant to Chapter 30A section 2 of the General Laws, and file such regulations with the Secretary of State pursuant to Chapter 30 section 37 of the General Laws. Local boards of health can, of course, adopt regulations merely by publication once in the newspaper of the town.

This section (27B) has not been used at all in the MAPC region. The increasing complexity of public health issues such as solid waste disposal, subsurface sewage disposal and septage disposal should make regional boards of health more attractive. Additionally, septic tank inspection and maintenance programs may be more cost effective if carried out at the regional level. Because of the role that local boards of health play in the subdivision plan approval process, if this function was carried out by a regional board of health there would be a greater consideration of the regional environmental impacts of subdivision development in the review and approval process. This would be particularly true if a regional health code and regional standards (permissible in a 27B district) were used in the review.

7. Regional Government - Conservation Districts. There are fifteen regional conservation districts established in Massachusetts under the Division of Conservation Services within the Executive Office of Environmental Affairs.³³

An unpaid State Committee for the conservation of soil, water and related resources supervises the districts and assists with educational work, the prevention of soil erosion, prevention of flooding and the conservation and disposal of water through cooperation with other agencies. It establishes boundaries of districts after public hearing on petition of a majority of the landowners or at least 100.

Five "supervisors" are originally appointed by that committee but are later elected by landowners on staggered five year terms. They elect their officers. They may invite other political subdivisions of the Commonwealth or Commissions to designate a representative to advise them.

The statute requires supervisors to conduct surveys, control erosion, conserve and develop water resources but only in cooperation with either the State or United States agencies. They may enter into agreement with any agency, governmental or otherwise, or any occupier of land. They may make available machinery, equipment and materials to assist land occupiers, may construct structures, may develop lands and may accept contributions of money or services from any government or person. They may sue and be sued in the name of the district. They have no power of eminent domain nor power to acquire land nor to levy taxes.

For the MAPC area, conservation district offices are located in Acton, Raynham, Walpole and Danvers serving the counties of Middlesex, Plymouth, Norfolk, and Essex respectively. Working with the U.S. Soil Conservation Service, Districts provide assistance in soil planning, small watershed projects and the inventory of natural resources. Districts also provide assistance to towns and land-owners by providing advice on forests, selective cutting, fish and wildlife problems and other conservation-related matters.

Financing for conservation district activity is provided by:

- 1) the state via appropriations and grants;
- 2) federal aid;
- 3) contributions and payments by local governments in respect to particular district projects undertaken in their territory;
- 4) payments by corporations, firms, landowners and others.

District costs are not assessed annually on cities and towns. Rather, local governments share in such costs on a negotiated, project by project basis.

Conservation districts presently have no authority to enforce any of their plans, policies or guidelines except where the consent of the landowner is obtained. Districts generally do not have full-time professional staff nor are their budget resources significant. They also generally lack experience in administering regulatory programs. However, they do have experience in dealing with certain non-point sources of pollution particularly those related

to agricultural and silvacultural activities, and problems related to erosion and sedimentation. Moreover, their geographic jurisdiction is broad enough to effectively consider the regional aspects of water quality management.

C. State Government

Various agencies of state government play significant roles in water quality management. State agencies currently carry out a number of activities important to water quality management including the regulation of point sources of pollution and many non-point sources such as landfills and septic tanks. State agencies monitor water quality and set water quality standards. They also supervise the construction of treatment facilities and provide funds for such construction as well as providing funds for land acquisition, and in the case of MDC, construct, operate and maintain wastewater treatment facilities. The important state agencies in terms of water quality management are described below.

1. State Government - The Executive Office of Environmental Affairs. In 1969, as part of a general reorganization of state government the Executive Office of Environmental Affairs was established.³⁴ This reorganization brought together some 43 different agencies and programs under one Secretariat, and assigned them among five major departments, four of which are discussed in this report (MDC, DEQE, DEM and DFW & RV).

The MDC, although possessing many of the attributes of a regional institution, is a state department within EOEa. The other three major departments (DEQE, DEM and DFW and RV) are discussed in following subsections.

In 1974, the powers and duties of the Executive Office of Environmental Affairs were codified as Chapter 21A of the General Laws.³⁵ Section two of that chapter states:

"The office and its appropriate departments and divisions shall carry out the state environmental policy and in so doing they shall:

- 1) develop policies, plans and programs for carrying out their assigned duties;
- 2) provide for the management of air, water and land resources to assure the protection and balanced utilization of such resources within the commonwealth, realizing that providing safe water to drink and clean air to breathe is a basic mandate;
- 3) provide for propagation, protection, control and management of fish, other aquatic life, wildlife, and endangered species and promote and further develop hunting, fishing, recreational and competitive marksmanship, and trapping opportunities in the commonwealth;
- 4) aid in the promotion and development of the food and agricultural resources of the commonwealth to preserve agricultural lands, and ensure an adequate supply of high quality farm products;

- 5) provide for the regulation and management of marine and coastal fisheries and natural resources including those located in the territorial waters, the economic zone waters and the continental shelf, wetlands, estuaries, shorelines, and interior of the commonwealth;
- 6) promote the perpetuation, extension, and proper management of the public and private forest lands of the commonwealth;
- 7) develop statewide policies regarding the acquisition, protection and use of areas of critical environmental concern to the commonwealth;
- 8) develop and administer programs relating to recreation including the acquisition of land, development of facilities, and the provision of advisory services to municipalities and private organizations;
- 9) promote the best usage of land, water, and air to optimize and preserve environmental quality by encouraging and providing for, in cooperation with other appropriate state agencies, planned industrial, commercial, recreational, and community development;
- 10) provide for the preservation and abatement of water, land, air, noise, and other pollution or environmental degradation;
- 11) promote the preservation and enhancement of natural, scenic, historic, and aesthetic qualities in both urban and rural areas;
- 12) provide for the control of insects, plant diseases, and pests, and regulate the use and disposal of pesticides;
- 13) develop programs relating to the reclamation or disposal of solid waste material and the operation of sewer and water systems;
- 14) encourage the restoration and reclamation of degraded or despoiled areas, including harbors and inland and coastal waters;
- 15) manage all lands and properties acquired by or assigned to them to preserve their natural beauty, wilderness, or open character of hydrological, geological, historical, scientific, wildlife management, recreational or other significant value;
- 16) assist other state and regional agencies in developing appropriate programs and policies relating to land use planning and regulation in the commonwealth;
- 17) analyze and make recommendations, in cooperation with other state and regional agencies, concerning the development of energy policies and programs in the commonwealth;

- 18) advise, assist, and cooperate with such other departments, agencies, authorities, officials, and institutions, including state institutions of higher learning, as may be concerned with or involved in matters under their control or supervision;
- 19) encourage recycling, resource recovery and environmentally sound purchasing practices to conserve resources and reduce wastes;
- 20) monitor the environment to identify changes and to ensure efficient and effective control practices;
- 21) develop environmental data management capabilities to aid environmental planning and decision-making;
- 22) encourage, support, and undertake research facilities to produce information relating to the ecological system, pollution preservation and abatement, resource management, and other areas essential to implementing the environmental policies of the commonwealth;
- 23) advise and assist local governments, private and public institutions, organizations and associations, businesses, industries, and individuals by providing and acting as a clearinghouse for environmental information, data and other materials;
- 24) promote the development of sound environmental education programs;
- 25) represent and act on behalf of the commonwealth in connection with federal programs;
- 26) keep accounts, records, personal data, enter into contracts, adjust claims, accept gifts, grants, bequests and devises, and subject to appropriation acquire real or personal property by eminent domain or otherwise;
- 27) advise and assist state agencies, cities and towns, and other units of local government in the preparation of grant of loan applications with respect to any environmental protection or enhancement programs;
- 28) promulgate rules and regulations necessary to carry out their statutory responsibilities."

In order to assist the office in the discharge of its duties, the Secretary may request from any agency or political subdivision of the commonwealth any information relevant to the discharge of such duties.

An information copy of each application submitted by any political subdivision to any public or private agency for a grant or loan with respect to

any environmental protection or enhancement program, including the acquisition of land and facilities for these purposes shall be filed with the office not later than the twentieth day after submission.

As the primary agency of the commonwealth for environmental planning, the office shall "utilize the services and plans of regional planning agencies, conservation districts, conservation commissions and historical commissions in fulfilling its environmental planning responsibilities."

The Secretary is also authorized to "conduct comprehensive planning with respect to the functions of the office", and to "coordinate the activities and programs of the departments and divisions within the office...with a view toward improving administrative organization, procedures and practices..."³⁶ In addition, in order to carry out this coordination and improvement of operations of all the departments, divisions and other administrative units within the office the secretary is given the following powers:

- 1) the power and duty to resolve administrative and jurisdictional conflicts between any such agencies or officers;
- 2) the power and duty to implement, upon request of any such agency or officer, programs jointly agreed to by the secretary and such agency or officer;
- 3) the power and duty to coordinate and improve program activities involving two or more such agencies or officers.³⁷

The secretary has the power to appoint program review boards to review each major program area within the office.³⁸

Finally, the secretary has the responsibility to review environmental impact assessments and reports filed under the Massachusetts Environmental Policy Act, and to approve the regulations of the other executive offices promulgated to carry out MEPA.³⁹

There are a number of other offices or divisions with the executive office other than the major departments noted above and discussed elsewhere in this report. The two offices which are deemed most important in terms of water quality management are discussed here.

The Office of Coastal Zone Management. In 1972 the Congress passed the Coastal Zone Management Act (P.L. 92-583). The Act authorized a new Federal program administered by the National Oceanic and Atmospheric Administration (NOAA), Office of Coastal Zone Management (OCZM). The purpose of the CZM Act is to provide the coastal states, which includes those bordering the Great Lakes, with Federal assistance in the form of grants to develop "a management program for the land and water resources of (their) coastal zone."

The Massachusetts Coastal Zone Management Program has been developed over the past three years with federal funding assistance to bring better management to the Commonwealth's coastal areas.

Implementation of the program will be accomplished through administration of existing laws which embrace the policies and criteria set forth in the

CZM Plan. No new laws are proposed, but new funding and technical assistance will be available to coastal communities wishing to further local and state coastal zone management objectives.

Additionally, memoranda of understanding with the five Commissioners of the departments within EOEa, and the Energy Facilities Siting Council have been prepared accepting the plan as the state environmental policy for the coastal zone, requesting that it be jointly implemented and agreeing to adopt the necessary rules and regulations necessary for implementation of the program. Other implementation mechanisms are through EOEa agency regulations (revised to reflect CZM policies), CZM regional maps and map commentaries and CZM guidelines.

The Coastal Zone Management Act also requires states to develop a process for designating areas as Areas for Preservation or Restoration in order to protect them for their conservation, recreational, ecological, or aesthetic values. In Massachusetts such areas will be designated by the Secretary of Environmental Affairs as Areas of Critical Environmental Concern, pursuant to Chapter 21A, section 2(7). Nominations of areas may be made by the citizens, by towns or Conservation Commissions, by state agencies, RPA's or members of the Legislature.

To ensure that areas nominated are critical, the regulations require that no area shall be eligible for designation unless it contains at least five characteristics from a list provided in the regulations. These characteristics include barrier beach systems, shellfish beds, erosion areas, historic sites, scenic areas, recreation sites. In order to designate an area, the Secretary may consider the significance of the area in regard to the following criteria: public health, quality of the area, productivity, uniqueness, irreversibility of impact, imminence of threat, economic benefit. If the Secretary decides to proceed with a designation, public notice is given for a hearing within twenty-five miles of the nominated area.

As a result of this designation, EOEa agencies will attach a high degree of scrutiny to their activities in the area, will not proceed with actions which could impair the values of the area, and will administer programs consistent with the EOEa policies regarding the acquisition, protection, and the use of such areas. State agencies outside the EOEa, will be unaffected by the designation except pursuant to MEPA, where no project conducted or permitted by any state agency shall qualify for a categorical exemption if it is located in an Area for Preservation or Restoration (APR).

A summary of Coastal Zone policies that will apply to designated APR's is as follows:

- high priority application of the Coastal Wetlands Restrictions Program to salt marshes, sandy beaches, shellfish beds, and dunes, and possible restriction of some upland where necessary to ensure full protection of the APR;
- high priority application of the Inland Wetlands Restriction Program to protect anadromous fish runs that may exist;
- high priority implementation of the Scenic Rivers Program;

- high priority for open space funds if requested;
- high priority for water quality clean-up projects.

In addition the Coastal Zone Management Program recommends that the following activities be prohibited or strictly controlled within designated Areas for Preservation or Restoration:

- the siting of energy facilities;
- new industrial discharges and the discharge of hazardous substances, including thermal effluent;
- new dredging except for maintenance of existing channels or for enhancement of shellfish and other marine food productivity;
- disposal of dredge spoil, except in instances when the spoil may be used for beach nourishment and/or dune stabilization; and
- the siting of new sewage treatment facilities.

The Division of Conservation Services. This division is located directly within the Office of the Secretary of EOEA and exercises authority pertaining to local acquisition of conservation lands and soil conservation district programs. In addition, the division exercises approval authority over the acquisition of conservation restrictions, recordable less-than-title interests in property which restrict the uses to which affected private lands may be put.

Acquisition of conservation restrictions, authorized by Chapter 184, section 32 of the General Laws, by any government agency, other than a state agency, is permitted on condition that the acquisition if approved by the Secretary of Environmental Affairs acting through the Division of Conservation Services.⁴⁰ Restrictions acquired by charitable organizations or trusts also require such approval and the approval of the mayor or city manager and the city council in the city in which the land or water area is located or the selectmen in the town in which the area to be restricted is sited.

The conservation restriction program is closely related to the division's other major approval authority, the "Self-Help" Program.⁴¹ Under this program, state matching funds are available to local governments through the Division of Conservation Services for the acquisition of land and water areas for conservation purposes. This funding, in an amount not exceeding fifty percent of the cost of acquisition, is available to communities that have established local conservation commissions pursuant to Chapter 40, Section 8C for acquisitions of land and water areas by such commissions. This program is, in turn, related to the Bureau of Outdoor Recreation's Federal Land and Water Conservation Fund.⁴² When this federal program is used the cost-sharing is then usually 50% federal, 25% state and 25% local.

Additionally, as noted above, the division also coordinates the establishment and operation of conservation districts (see discussion of conservation districts above, under "Regional Government").

2. State Government - The Department of Environmental Quality Engineering. The Department of Environmental Quality Engineering in the Executive Office of Environmental Affairs has extensive, but not always exclusive, management responsibilities and authorities in water quality related areas.

In an effort to coordinate the agency's permit granting authorities the organizational structure of DEQE has been revamped to establish four divisions. Two of these, the Division of Water Pollution Control and the Division of Water Supply existed under the prior structure. The two other divisions are the Division of Land and Water Use and the Division of Air and Hazardous Materials. The Water Resources Commission and the Hazardous Waste Disposal Board, both within DEQE, have not been affected by this administrative reorganization. DEQE also has a Bureau of Planning and Program Management which serves the Commissioner of DEQE and, in many cases, the Secretary of Environmental Affairs, and among other duties, has been assigned the task of planning for the non-designated 208 areas in Massachusetts. The scope of the authority of the Division of Water Pollution Control is noted in the following section.

The Division of Land and Water Use operates three programs which have a role in water quality management: the Wetlands Program, the Waterways Program, and Community Sanitation Program.

The Wetlands Protection Act (Chapter 131, Section 40, MGLA) provides that any person who plans to work in or alter a wetland area must notify the local conservation commission (or mayor or selectmen if no Conservation Commissions exists) as well as abutters and DEQE. Conservation Commissions may regulate projects by issuing an order of conditions. Any applicant, any person aggrieved by the order, an abutter, or ten citizens may request DEQE to review the application and the Conservation Commission's actions.

The Waterways Program is authorized to review construction activities below the high water mark in all coastal areas (Chapter 91, Section 14-18, 20-23, MGLA), construction activities in or on any stream in the Commonwealth subject to MGLA Chapter 91, Sections 10, 12, 12A, 14 and 15, and construction activity in all Great Ponds pursuant to Massachusetts General Laws, Chapter 91, Sections 13, 19A and 22. In addition, all material dredged in the tide-waters of the Commonwealth must be transported and disposed with the approval of DEQE (Chapter 91, Section 2, 52, 55, and Chapter 347, Acts of 1976).

Within the Community Sanitation Program, there are two authorities directly involved with water quality management. The State Environmental Code is administered by DEQE (Chapter 111, Section 17, and Chapter 21A, Section 13). Title 5 of the Code applies to the subsurface disposal of sewage. Recently revised, Title 5 gives responsibility for sewage systems with volumes less than 15,000 gallons per day to local boards of health, and reserves authority for systems with volumes greater than 15,000 gallons per day, all mobile home and harbor parks, and also industrial waste facilities discharging to the ground for DEQE.

The Community Sanitation Program also permits DEQE to regulate the designation of a site or the construction of facilities to receive and dispose of wastes from privies, cesspools and septic tanks. Application for such approval is made initially to the local board of health. (Chapter 111, Sections 31D, MGLA.)

The Division of Water Supply is charged with the Department of Environmental Quality Engineering's responsibility for the general oversight and care of all inland waters and of all streams, ponds and underground waters used by any city, town, water supply or fire district or public institution or by any water or ice company or any person in the Commonwealth as sources of ice or water supply and of all springs, streams and watercourses thereto. (Chapter 111 Section 159) DEQE may order examination of such waters to ascertain their purity and may make rules and regulations to protect their purity. The department may delegate authority for the protection of these waters to other state departments or to selectmen, boards of health, or water boards in cities or towns. (Chapter 111, Section 160). DEQE may hold hearings to determine the sources of pollution and issue orders to abate such sources. (Chapter 111, Sections 160B, 162).

DEQE has recently enacted drinking water regulations for all public water systems in Massachusetts. These regulations are drafted to allow DEQE to obtain primary enforcement responsibility under the Federal Safe Drinking Water Act (42 U.S.C. §§ 300f-300g-5). They include siting requirements for new or modified public water systems; maximum contaminant levels for microbiological contaminants, organic and inorganic contaminants; turbidity contaminants and radionuclide contaminants; laboratory certification requirements, secondary standards for drinking water; distribution storage requirements, and regulations relating to surface water and groundwater supplies.

Under Section 7A of Chapter 85 of the General Laws the storage of sodium chloride, calcium chloride, chemically treated abrasives or other chemicals used for snow and ice removal from roads shall not be done in a manner or place which may contaminate a water or groundwater supply. DEQE has the authority to issue regulations as to how such chemicals may be stored and may "by specific order, in a particular case regulate the place where such chemicals may be used for such purpose." The section requires any person using more than one ton of snow removal chemicals in a year to report annually to DEQE as to the amount used, specified by road section, and the amount of chemicals on hand. DEQE "may require studies...of the probable impact of proposed new or improved highways and the maintenance thereof by use of such chemicals upon reservoirs, ponds, streams, lakes, wetlands and the groundwater aquifers associated with both public and private water supplies."

The section gives DEQE broad authority to control how road salt is stored and used in the Commonwealth. However, the full implementation of this section has not yet been achieved in that no regulations under this section have yet been issued. While the state Department of Public Works is currently exercising care in its storage of salt, storing the chemicals in sheds whenever possible and experimenting with new policies to reduce the amount of salt used on roads, the activities of local highway departments continue to be largely unregulated in this area.

However, the failure of the legislature to adequately fund this section of the General Laws has seriously hampered DEQE's ability to promulgate regulations and require the annual reports on salt use.

The Division of Air and Hazardous Materials is responsible for ensuring that new and modified sources of air pollution, (1) conform to emission limitations contained in Massachusetts regulations, Federal New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air

Pollutants (NESHAPS), and (2) assure continued conformance with Massachusetts and Federal National Ambient Air Quality Standards (NAAQS). Sources subject to this regulatory review include fossil fuel utilization facilities having energy input capacity greater than 3 million BTU's per hour; incinerators; and industrial facilities such as foundries, refineries, paper manufacturing plants, and other manufacturing plants. Additionally, the Air Quality Program regulates the storage and loading facilities for petroleum products, gas and other hydrocarbons to minimize unnecessary emissions of hydrocarbons which contribute to the formation of photochemical oxidants or smog.

The Water Resources Commission. The commission is a unique institution located within DEQE, but co-chaired by the Commissioners of DEQE and DEM⁴³. The commission exercises supervisory and policy responsibilities relative to DEQE's Division of Water Pollution Control and DEM's Division of Water Resources. The commission is responsible for the state administration of programs related to federally-funded works of improvement under the Federal Watershed Protection and Flood Control Act, and is authorized to acquire lands, waters or easements to protect water impoundments sites and adjacent land. It is also authorized to construct and maintain reservoirs for purposes of providing low-flow augmentation and flood control.

The Hazardous Waste Disposal Board. The board has the authority to regulate and approve the handling and disposal of hazardous waste materials.⁴⁴ Administration of the board's regulations is delegated by statute to the Division of Water Pollution Control. These regulations identify the materials for which handling and disposal licenses are required, specify the manner in which hazardous wastes are to be handled and disposed of, designate sites at which disposal without damage to natural resources or the environment is possible and permissible, establish categories of exceptions to generally applicable requirements and set license and inspection fees.⁴⁵

DEQE clearly has the legal authority to carry out a number of programs critical to water quality management, and has the technical and managerial skills necessary to carry out these functions. However, recently it has had problems in obtaining adequate funds from the legislature to carry out its programs. The recent cut-back in its involvement in the administration of Title 5 is but one example. This lower level of funding is an indication that DEQE's programs are less politically acceptable now than when the authority was conferred. This is at least true in the legislature. Local growth policy statements generally do not indicate this same level of dissatisfaction.

As a state agency, DEQE does not possess a high level of political accountability. However, it has recently attempted to address this through the formation of program review boards to consider the operation of some of its programs. In spite of the fact that DEQE is an environmental agency, its involvement in many different areas enable it to consider many factors in its policy-making process. This breadth of authority also would enable it to perform key roles in coordinating management agency functions.

3. State Government - The Division of Water Pollution Control (DWPC)
 Administratively, the Division of Water Pollution Control is within the Department of Environmental Quality Engineering (DEQE) which is one of the departments under the Executive Office of Environmental Affairs. In addition, DWPC is subject to the authority of the Water Resources Commission which is composed of the Commissioners of Food and Agriculture, Commerce and Development, Metropolitan District Commission, Environmental Wildlife and Recreational Vehicles, and four persons appointed by the Governor, who represent a major type of water user. In turn, DWPC and the Water Resources Commission are bound by the Commonwealth's environmental laws. The DWPC has the broadest authority in the state for water quality management.

DWPC powers and duties include the encouragement of the adoption and execution of plans for the prevention, control and abatement of water pollution; cooperating with federal agencies and the agencies of other states in matters related to water quality control and assisting agencies of the Commonwealth and its political subdivisions with water pollution problems; taking all action necessary to secure to the Commonwealth the benefits of the Federal Water Pollution Control Act; conducting a program of study, research and demonstration relating to new and improved methods of pollution abatement or more efficient methods of water quality control; adopting minimum water quality standards for the Commonwealth; prescribing effluent limitations, permit programs, and where appropriate, prohibiting discharges; requiring discharges to establish monitoring, sampling, record-keeping and reporting procedures and facilities; examining periodically the water quality of the various coastal waters, rivers, streams, lakes and ponds of the Commonwealth and reporting the results; adopting regulations for the proper operation and maintenance of waste treatment facilities; conducting the continuing planning process for planning the reduction, control and elimination of the discharges to waters of the Commonwealth, including river basin plans and regional plans; adopting, amending or repealing, with the approval of the Water Resources Commission rules and regulations for the proper administration of the laws relative to water pollution control and the protection of the quality and values of water resources; requiring the submission for approval of reports and plans for abatement facilities and inspecting the construction for compliance with such approved plans and finally, undertaking immediately to contain and remove oil spills to the waters of the Commonwealth or off-shore waters, where damage or injury to the waters of the Commonwealth or to citizens of the Commonwealth may occur.⁴⁶

The DWPC, with the approval of the Water Resources Commission, can propose the formation of water pollution abatement districts consisting of one or more cities or towns, or can form such a district mandatorily, if it finds the establishment of such a district necessary for the abatement of water pollution.⁴⁷

The DWPC controls point sources of pollution in the Commonwealth and has the potential to control non-point sources. The Massachusetts Clean Waters Act (Chapter 21, section 43(2) of the General Laws) states:

"No person shall discharge pollutants into waters of the Commonwealth nor construct, install, modify, operate, or maintain an outlet for such discharge or any treatment works, without a currently valid permit issued by the director. No person shall engage in any other activity

that may reasonably be expected to result, directly or indirectly, in discharge of pollutants into waters of the Commonwealth, nor construct, effect, maintain, modify, or use any sewer extension or connection, without a currently valid permit issued by the director, unless exempted by regulation of the director."

Pollutant is defined in the Act as:

"any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter, in whatever form and whether originating at a point or major nonpoint source, which is or may be discharged, drained or otherwise introduced into any sewerage system, treatment works or waters of the Commonwealth."⁴⁸

The Massachusetts Clean Waters Act therefore covers both point and "major non-point" sources of pollution. The Act does not provide a definition as to what constitutes a major non-point source. However, since this section was added by the 1973 amendments to the Act it is presumed that its scope of coverage includes, at a minimum, those non-point sources of pollution identified in Section 208 of the FWPCA (PL 92-500).

The Massachusetts Clean Waters Act goes beyond the scope of the FWPCA in its definition of "Waters" and "Waters of the Commonwealth" which include "rivers, streams, lakes, ponds, springs, impoundments, estuaries, coastal waters and groundwaters." The control of groundwater pollution is not within the scope of P.L. 92-500. Its inclusion in the Massachusetts Clean Waters Act is a tribute to the insight of its drafters in recognizing the inter-relationships between groundwater and surface water.

In terms of having staff skilled in the technical aspects of water pollution control, DWPC must be considered preeminent in the state, and of course, geographically its jurisdiction covers the entire state. The inadequacy of funding to carry out increased management responsibility could create obstacles to effective water quality management. Aside from being accountable to the legislature for its budget needs, DWPC has very little political accountability. This is, of course, true of all state agencies. Finally, the limited scope of DWPC's subject matter jurisdiction may preclude consideration of other environmental, economic, or social objectives in developing water quality management plans and policies.

4. State Government - Metropolitan District Commission. The Metropolitan Sewerage District, established in the Commonwealth in 1889, was the first legally constituted metropolitan district in the United States and originally served 19 cities and towns. In 1901, the Metropolitan Sewerage Commission and the Metropolitan Water Board (established in 1895) were abolished and their powers and duties were transferred to the Metropolitan Water and Sewerage Board. In 1919 the Metropolitan District Commission was created to assume the powers, duties, and responsibilities of the Metropolitan Parks Commission and the Metropolitan Water and Sewerage Board. With the creation of the Executive Office of Environmental Affairs in 1974, the MDC became a department within this cabinet level executive office. It is therefore a state agency and not a truly regional entity.

The Metropolitan District Commission currently has an aggregate community membership of 54, with the Metropolitan Sewerage District currently having 43 member communities. The MDC is headed by a Commissioner and four Associate Commissioners. The Secretary of the Executive Office of Environmental Affairs (EOEA) appoints the Commissioner, with the approval of the Governor. The Governor appoints the Associate Commissioners. The Commissioner is responsible for the overall administration of the MDC and retains a veto power over decisions made by the Commission as a whole. However, the Massachusetts Legislature makes the overall policy decisions and controls appropriations for maintenance and construction of the system.

Requests for appropriations for operating and maintenance expenses, debt service and other special projects are projected annually and submitted to the Secretary of the EOEA for inclusion in EOEA's budget request. After review and adjustment by EOEA, the Executive Office of Administration and Finance (A&F) and the Governor, the total budget for the executive, legislative and judicial branches of government is submitted by A&F to the General Court where, after hearings and debate by the Senate and House of Representatives, it is enacted. It should be noted that those costs directly attributable to the water, sewer and parks districts are eventually reimbursed to the State by the cities and towns served by these districts.

For projects involving capital outlays of over \$10,000 for acquisition of land or construction, reconstruction or repair of facilities a capital budget is prepared with a procedure for review similar to the one noted above for operating and maintenance expenses. However, for each project a legislative petition is prepared identifying the project, its cost and the proposed method of financing. Again, the capital budget is enacted by the General Court and approved by the Governor and thereafter serves as the basic tool in scheduling capital expenditures.

To finance large construction projects general obligation bonds are sold by the State Treasurer, backed by the full faith and credit of the state. Because the debt resulting from the sale of bonds to finance MDC projects is not incurred for the benefit of the entire state it is classified as contingent debt, and the interest and principal payments relating to such debt are annually assessed against the member communities.

In 1975 the legislature amended the statute governing the operation of the Metropolitan Sewerage District. This act, Chapter 814 of the Acts of 1975, was drafted to assure that MDC could comply with the requirements of the Federal Water Pollution Control Act Amendments of 1972; specifically, those relating to user charges, industrial cost recovery, pretreatment requirements, and the authority required by section 208(c)(2)G, to assure that each participating community pay its proportionate share of treatment costs.

Under the provisions of Chapter 814, section 6, operation and maintenance costs for the MSD will be assessed according to the following:

"The proportions in which the cities and towns included in the Metropolitan Sewerage District system shall annually pay to meet the total cost of operation and maintenance, including replacement, of the system shall be based on their respective populations contributing to the system and on the population equivalents of other wastes contributed to the

system by the respective cities and towns, as determined by the commission. If less than the whole area of any city or town is included in the metropolitan sewerage district, the contributing population and population equivalents only of that part of the city or town served by the district, as determined by the commission, shall be used as a basis for determining the proportions to be paid under this section..."

In fiscal year 1978 operation and maintenance charges will be computed to meet the provisions of Chapter 814. A study on user charge and industrial cost recovery systems has been completed for the MDC.⁴⁹

For the assessment of principal and interest charges, Chapter 814, section 5 states that:

"The proportion in which each of the cities and towns included in the Metropolitan Sewerage District shall annually pay to meet the total interest and principal requirements for each fiscal year on debt incurred for the metropolitan sewerage district, shall be based on the respective populations of said cities and towns as ascertained by the last preceding state census, and on the population equivalents of the industrial waste... contributed to that system by the respective cities and towns, as determined by the commission."

In compliance with the law MDC assessed its MSD member communities according to the above-mentioned provisions for fiscal year 1977. It does this by tabulating state census populations and estimating population equivalents for industries located in each of the MSD member communities. Population equivalents are only determined for those industries whose water consumption exceeds 50,000 gallons per day.

In addition to the provisions mentioned above for the assessment of operation and maintenance costs and principal and interest charges, the cost of construction of extensions of the MSD system to provide service for additional cities and towns or to provide additional service for one or more cities and towns must be paid by the benefitted cities and towns "to the extent that such cost is not met by federal or state construction grants." "The annual amounts required to meet payments of principal and interest on debt incurred to finance such construction... shall be apportioned among such benefitted cities and towns in proportion to the respective additional capacities thereby made available to them by such construction."⁵⁰

The authority of the MDC to adopt reasonable rules and regulations covering the discharge of sewage, drainage, substances or wastes into its system is well established.⁵¹ Moreover, such authority includes the ability to levy an assessment of damages against any municipality which fails to comply with such rules and regulations⁵² and to impose a fine against anyone who violates such rules and regulations of not less than \$1,000 nor more than \$10,000 for each day such violation continues, or to seek a civil penalty not to exceed \$10,000 per day for such violation.⁵³ In the case of malicious injury to the system treble damages may be assessed and upon conviction a fine not exceeding \$1,000 and imprisonment not exceeding 1 year may be imposed.⁵⁴

The MDC, again as a result of the passage of Chapter 814 of the Acts of 1975, has the authority to require that any municipal, industrial or other user of the system meet any applicable federal or state law regarding toxic and pretreatment standards⁵⁵ (subject to the sanctions mentioned above).

Under proposed MDC "Rules and Regulations covering Discharge of Sewage, Drainage, Substances, or Wastes to Sewerage Works within the Metropolitan Sewerage District" (which may be in effect by the time this report is published) every user discharging industrial wastes into the Metropolitan Sewerage System, or a tributary system, must obtain a joint permit from the MDC and from the municipality where the discharge originates. These permits may contain such conditions as MDC and the municipalities require, including applicable federal or state standards (Article IV, regulation 2 of proposed regulations).

The MDC must be considered to have adequate legal authority to perform its sewerage functions, in light of recent amendments to its enabling statute and sewer use regulations. However, its control over local systems is still limited. While detailed plans have been developed for the upgrading of its facilities (see EMMA) existing facilities suffer from age and obsolescence. While the ability of MDC to identify violators of its standards and to take enforcement could be improved as a result of chapter 814 and its industrial survey, it is still too early to judge the extent of this increased effectiveness. MDC's status as a state department within EOEA has definite advantages in terms of its ability to secure adequate finances and in access to state decision-makers. However, this state status also limits its accessibility by the communities, citizens and businesses which it serves, and could be a drawback in the implementation of new and innovative programs, for it does not foster a cooperative attitude. Administrative restrictions of state government regarding the hiring of new employees; civil service statutes and regulations restricting flexibility in hiring and assigning staff; inadequate salary ranges for mid-level professional staff; and administrative and bureaucratic procedures affecting MDC and its personnel have all been noted as limitations to effective wastewater management.⁵⁶

5. State Government - The Department of Environmental Management. The Department of Environmental Management in the Executive Office of Environmental Affairs has major responsibility for the management of public resources within the Commonwealth. Included within its wide-ranging jurisdiction is the management of state parks, reservations, forests and beaches and the administration of legislatively-established ocean sanctuaries. The department is also jointly responsible with the Department of the Metropolitan District Commission (MDC) for the development and administration of the Boston Harbor Islands Park.

DEM is also concerned, through its Bureau of Solid Waste Disposal, with solid waste facilities management. It is involved in planning for solid waste disposal and in the acquisition and disposition of lands used for solid waste disposal facilities. Its authorities, only some of which pertain to public lands and facilities management, are exercised in coordination with DEQE and other state, regional and local agencies.

DEM's Bureau of Solid Waste Disposal is authorized to dispose of solid waste and to acquire lands and plan, design, construct, maintain and operate solid waste disposal facilities.⁵⁷

Jurisdiction of the bureau extends to the establishment of its own facilities and solid waste disposal districts and facilities. The bureau is directed by statute to encourage improved methods of solid waste disposal, including resource recovery and recycling, and to engage in research and demonstration projects in that regard.⁵⁸

The bureau will also be conducting statewide solid waste planning under the recent Federal Resource Conservation and Recovery Act (PL 94-580).

The bureau is directed by statute to study the solid waste disposal needs of the state and to develop proposed programs and implementation plans for meeting these needs. It may designate regional solid waste disposal districts and, in cooperation with DEQE, develop and maintain a statewide solid waste disposal master plan in order to satisfy funding eligibility requirements of the Federal Solid Waste Disposal Act. The bureau is authorized to establish the amount to be assessed each town within such districts for the costs of district solid waste disposal facility construction, maintenance and operation. Monies received from the collection of assessment, together with all other funds received for solid waste disposal purposes, become a part of the division-administered Solid Waste Disposal Fund which is to be used for management, maintenance and operation of the bureau and district solid waste disposal facilities.⁵⁹

DEM's Wetland Restriction Program⁶⁰ is designed to identify in advance of particular development proposals wetland areas meriting preservation, and to adopt "...orders regulating, restricting or prohibiting dredging, filling, removing or otherwise altering or polluting..." fairly large wetlands areas. In floodplain areas, such orders must by statute provide that "no obstruction or encroachment shall be placed by any person, firm or corporation, public or private, unless authorized by the commissioner." Prior to imposing an order, the commissioner is required to hold a public hearing in the affected municipality or municipalities, and to give notice to affected property owners who have 90 days in which to challenge the proposed restriction in court. Final orders are recorded in the appropriate registry of deeds and are binding on subsequent owners of the properties.

Under the restriction program, responsibility and authority are vested primarily at the state level, allowing DEM to override more permissive local regulations for the areas in question. Chapter 131 s. 40A, covering inland wetlands, modified this slightly by requiring approval by the selectmen or city council prior to adopting an order, but the commissioner may still, "after expiration of six months from the date of such approval and after due consideration of the reasons for such disapproval, adopt such order...".

The restriction program possess the distinct advantage of allowing for comprehensive planning of wetlands protection measures. Under the statutes, the commissioner is free to impose restrictions before gradual cumulative development has, bit by bit, seriously impaired a wetland; such impacts may not be noticeable early enough in the course of case by case review, or may relate to patterns of growth rather than individual projects.

Under Section 17B of Chapter 21 of the General Laws, the commissioner of environmental management with the approval of the Board of Environmental Management may designate rivers in the Commonwealth as "scenic" rivers and may apply restrictive orders which regulate, restrict or prohibit the "dredging,

filling, removing, or otherwise altering or polluting" these scenic rivers. The regulations apply to the river and contiguous land (up to 100 yards from the natural bank). Appeal procedures and public hearing requirements are stipulated in the statute.

Until recently, little had been done to implement this statute. However, in January 1977, the commissioner of environmental management designated the North River a demonstration project under the Scenic and Recreational Rivers Program. This project will consist of a detailed investigation of the characteristics of the river and its watershed to determine the type of orders of conditions which are appropriate. This study, now underway, will serve as a model for designation of other rivers in the state as scenic. Concurrent with the study of the North River, the characteristics of other rivers in the state will be reviewed as a preliminary step to possible eventual inclusion in the program.

The purpose of the protective orders to be issued by the Department of Environmental Management (DEM) are to promote the health, safety, and welfare, to protect private as well as public property, wildlife, freshwater fisheries, and irreplaceable wild, scenic, and recreational river resources.

The Division of Water Resources is also within the Department of Environmental Management, and, as noted above, is under the control of the Water Resources Commission. It has jurisdiction over matters concerning watersheds, water systems, storage basins, underground and surface water supplies, water conservation and flood prevention. The Commission is intended to act as a coordinating mechanism between all departments of the commonwealth.

The Department of Environmental Management, like DEQE, suffers from many of the same types of problems in terms of staff and budget limitations. Because of the structure of its programs, opportunities for citizen and interest group involvement appear greater than with an agency, such as DEQE, that is primarily regulatory in nature. This program structure also lends itself to a broader consideration of other social, economic and environmental goals in the implementation of its statutory mandates. In short, the basic concepts behind DEM programs seem sound, and the department generally possesses competent technical and managerial personnel to carry out these programs.

As in all large state agencies, there are undoubtedly staff and budget cuts which could be made without hampering program efficiency. Civil Service requirements constrain actions in this regard. Beyond that, more staff and budget resources could do much to ensure that all areas of the state benefit equally from DEM programs.

D. Federal Government

While the water quality management system will operate primarily at the state, regional and local level, the interplay with various federal agencies and programs will be crucial in providing funds and, in some instances, imposing sanctions for noncompliance. For this reason, those federal agencies and programs closely related to water quality management are briefly described.

1. Federal Government - The Environmental Protection Agency. The EPA must, of course, be considered the principal federal actor in water quality

management. This involvement stems primarily from its administration of the Federal Water Pollution Control Act. However, it also administers a variety of other environmental statutes which must be considered in water quality management.

On August 7, 1977 President Carter signed into law the Clean Air Act Amendments of 1977 (P.L. 95-95).⁶¹ The revision of the Clean Air Act was necessitated by the realization that many of the clean up deadlines set in the original act were unrealistic in many respects. The new amendments contain new provisions relative to automobile emissions and significant deterioration of air quality in clean air areas. It also deals with problems related to the nonattainment of primary ambient air standards, pollution from federal facilities, the permissibility of dispersion enhancement and periodic plant shutdown, as compliance devices in lieu of continuous emission controls, and the implementation of transportation controls and indirect source review procedures. It contains a new enforcement mechanism relying on an economically tailored noncompliance penalty designed to remove the economic incentive for delay in meeting pollution control standards. The Act relates to water quality in a number of ways. The burning of sludge from sewage treatments plants may cause air pollution problems. The disposal of pollutants generated by power plant scrubbers may result in water pollution. Particles in the air that settle to the ground are eventually washed away by rain or snow and may enter waterbodies and degrade water quality. The location of waste treatment facilities can have major growth inducing impacts creating subsequent air quality problems, and similarly, air pollution requirements may direct industry towards areas with water quality problems.

The Safe Drinking Water Act of 1974 (P.L. 93-523) provides for the safety of drinking water supplies by establishing and enforcing national drinking water standards. EPA is responsible for establishing federal standards and the state is responsible for enforcing standards and otherwise supervising public water supply systems.

Major provisions include:

- a) Establishment of primary regulations for the protection of public health.
- b) Establishment of secondary regulations relating to taste, odor, and appearance.
- c) Measures to protect underground drinking water sources.
- d) Research and studies regarding health, economic and technological problems or water supplies.
- e) Aid to the states to improve drinking water programs.
- f) Monitoring of drinking water supplies.
- g) Notification to customers of failure to comply with the drinking water regulations.
- h) Variances and exemptions to extend the time of compliance by any public water system.

The provisions of primary interest to 208 planning include the measures to protect underground drinking water sources and the monitoring requirements for surface and underground drinking water supplies.

The act requires EPA to develop minimum requirements for state programs to prevent the endangerment of underground sources of drinking water from the uncontrolled underground injection of fluids. The burden of proof of non-endangerment is placed on the injector who must maintain monitoring records or report periodically to the state.

Drinking water standards and monitoring requirements for public water supplies in this state are specified in the drinking water regulations of Massachusetts promulgated by DEQE. According to the SDWA, these regulations must be at least as stringent as federal regulations. As of December 1, 1977 Massachusetts has primary responsibility for enforcing the requirements of the SDWA in the state. State drinking water standards and monitoring requirements have been developed for contaminants including microbiological, inorganic, organic, turbidity and radionuclide.

The bacterial standard requires a sampling frequency dependent upon the population served, with the minimum number of samples per month ranging from 1 to 500.

Standards for inorganic contaminants require sampling, once a year for surface supplies and at three year intervals for groundwater supplies. Inorganic contaminants include nitrate, sodium, arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver and fluoride. The twenty chemical quality parameters analyzed under previous state standards will continue to be analyzed on an annual basis. Iron, manganese, sulfate and chloride will be similarly analyzed, but standards for these contaminants are secondary, based on taste, odor or appearance only.

Organic contaminant standards are proposed for six chlorinated hydrocarbon pesticides. Surface water supplies are required to be analyzed for these contaminants at no less than three year intervals. Only those groundwater systems specified by the Department are required to be analyzed for organics.

The radionuclide standard requires analysis of all community water supplies every four years. Daily analysis of surface water supplies are required to determine the contaminant level for turbidity.

The monitoring requirements of the SDWA can be extremely useful in identifying sources of groundwater pollution in the area. However, it provides no advance warning of the contamination and, therefore, is not particularly effective as a non-point source control device.

The Resource Conservation and Recovery Act of 1976 (P.L. 94-580) recognizes solid waste to be a uniquely local problem, which should be managed by states, local government, and regional groups. The new law amends the Solid Waste Disposal Act of 1965 to provide federal regulation of hazardous wastes, financial assistance to states for solid waste management planning, and funding for research, development, and demonstration of new technology for garbage reduction and disposal and resource recovery. The bill emphasizes development of methods for extracting usable metals, paper, glass and energy from wastes.

The legislation also strengthens and broadens EPA authority to regulate solid waste and creates an Office of Solid Waste in EPA headed by a new deputy administrator.

Hazardous waste regulation, presently under the control of the Division of Water Pollution Control, may remain under state regulation as long as federal requirements are met. Appropriations of \$25 million per year are authorized in fiscal 1978 and 1979 to help states develop and implement their own regulatory programs.

State solid waste management planning grants are authorized for fiscal 1978 and 1979. Such plans must comply with EPA standards that include a phaseout of open dumps within five years. State plans must also identify responsibilities of states, regional and local authorities and strategies for funds distribution.

The law also provides grants for local authorities. Another \$15 million in 1978 and 1979 are authorized for local authorities for such purposes as facilities planning, feasibility studies, market surveys, source separation projects, etc., but may not be used for construction or land acquisition.

This act should be important in terms of water quality management not only in planning for effective solid waste disposal, which will have minimal water quality impacts, but also in dealing with associated sludge management problems.

The Toxic Substances Control Act of 1976 (P.L. 94-469) is designed to regulate chemical substances that present a hazard to health or the environment. It not only seeks to control a wider range of chemical hazards, but also seeks to control them at their source before they are dispersed into the environment, resulting in hazardous exposures and difficult, if not impossible, clean-up problems.

The control of toxic substances under the Toxic Substances Control Act is but one aspect of EPA's expanded emphasis on toxics. Under the Federal Water Pollution Control Act, the EPA, initially as a result of a court case brought by the Natural Resources Defense Council (NRDC v. Train 6 ELR 20588 (D.D.C.1976)) and more recently by Amendments to the FWPCA, will be addressing toxic substances under various aspects of that Act (including S.S. 301/303, 307, 302 and 311). It is now recognized that the National Pollutant Discharge Elimination System (S. 402) has not dealt effectively with the discharge of toxic substances, and the inability of EPA to effectively come to grips with industrial pretreatment and sludge disposal has also contributed to the problem. This is, apparently, a priority concern for EPA under the Carter administration.

The Marine Protection, Research and Sanctuaries Act of 1972 (P.L. 92-523) was enacted to regulate the dumping of material into ocean waters. It requires that any person transporting material for the purpose of dumping it into ocean waters or dumping material into the territorial sea or the contiguous zone (12 nautical miles seaward) obtain a permit from the EPA Administrator. The administrator may also designate recommended sites or times for dumping. A permit is not required under this act for the discharge from any outfall structure regulated under the Federal Water Pollution Control Act. A permit from the Secretary of the Army (Corps of Engineers) is required for the

transportation of dredged material for the purpose of dumping it into ocean waters. This act also authorizes the Secretary of Commerce to designate areas of the ocean waters as "marine sanctuaries" for the purpose of preserving or restoring such areas for their conservation, recreational, ecological, or aesthetic values.

A bill that would set a mandatory deadline for ending ocean dumping of sewage sludge was recently approved by the House and Senate, and is awaiting executive action. This measure would amend the Marine Protection, Research and Sanctuaries Act by stating that no permits for ocean dumping of sewage sludge are to be issued after December 31, 1981. Very strict guidelines are set for granting extensions to this deadline.

Of course, the Federal Water Pollution Control Act is the primary statute through which EPA will be involved in water quality management.

As previously noted in the introduction of this report, it provides for basin plans (S. 303) for each river system in a state; facilities plans for the construction of municipal treatment projects (S. 201), areawide water quality management plans (S. 208) and a continuing state planning process (S. 208 & 303) to coordinate all of the above.

Section 402, creates a mechanism for the EPA, or the states in compliance with federal requirements, to implement point source pollution standards through a comprehensive permit system (the NPDES permit program). The permits are issued only after compliance with Sections 301, 302, 306, 307 and 308 of the Statute or other conditions imposed by the EPA which are necessary to carry out the Act.

Section 208(e) provides that "no permit under Section 402 of this Act shall be issued for any point source which is in conflict with a plan approved pursuant to subsection (b) of this section."

In order to be delegated authority for the 402 permit program, the states must, pursuant to section 402(b) of the FWPCA, meet the following minimum requirements:

- a) Have authority to issue permits which insure compliance with technology-based federal effluent guidelines, achievement of water quality standards, and control of disposal of pollutants into wells;
- b) Have authority to implement public notice procedures and coordinate with other states, EPA, and the Army Corps of Engineers;
- c) Have authority to conduct an inspection program to determine compliance with effluent limits;
- d) Have authority to abate violations of the permit program particularly to include civil and criminal penalties equivalent to those in the FWPCA; and
- e) Have authority to ensure that industrial users of municipal treatment plants give notice of new or increased discharges and pay a pro rata share of costs.

Section 201 of the Act provides grants to "any state, municipality, or intermunicipal or interstate agency for the construction of publicly-owned treatment works." This is, of course, the program which has enabled many communities to begin work on upgrading existing treatment facilities or constructing new facilities. Federal financial assistance is available for 75 percent of allowable costs for new construction, expansion, and reconstruction for treatment works in the State Municipal Projects Priority List. (Section 106.)

The primary objective is to fund, on a priority basis, those treatment works that are: 1) most likely to improve water quality to meet the goals of the Act; 2) cost-effective; and 3) capable of being operated and maintained efficiently.

Section 201 grants are presently awarded according to a 3-step process. The three steps are:

- Step 1 - Develop facilities plans and related elements.
- Step 2 - Prepare construction drawings and specifications.
- Step 3 - Fabricate and build treatment works.

Through federal and state funding, which combined pay for 90 percent of eligible construction costs, there is a tremendous incentive for communities to construct these facilities. While it is necessary for many communities to construct these new facilities in order to meet the requirements of the act, many communities may be choosing expensive municipal sewerage systems without adequately evaluating some of the less expensive, non-structural alternatives identified in this report. Additionally, communities are induced to deal with pollution problems after they become problems, which might forestall or, in some cases, eliminate the need for expensive sewerage.

Section 314 of the FWPCA provides that each State shall prepare or establish and submit to the Administrator or the Environmental Protection Agency: (1) an identification and classification according to eutrophic condition of all publicly owned freshwater lakes in such State; (2) procedures, processes, and methods (including land use requirements) to control sources of pollution of such lakes; and (3) methods and procedures, in conjunction with appropriate Federal agencies, to restore the quality of such lakes.

Grants of up to 70 percent of the funds expended by states to carry out these methods and procedures are to be made available under this section. In addition, the Administrator of the EPA is authorized, by section 104(h)(A), to enter into contracts with, or make grants to, public or private agencies and organizations and individuals for the purpose of developing and demonstrating new or improved methods for the prevention, removal, reduction, and elimination of pollution in lakes, including the undesirable effects of nutrients and vegetation.

It is under the authority of these two sections that EPA has developed its "Clean Lakes" program. While this program was not funded to the extent first envisioned by Congress, some 34 million dollars in funds have been appropriated to date (15 million for this fiscal year - nationwide). These funds are available on a 50 percent matching basis.

An application for financial assistance can only be made after a specified and detailed course of action to restore the lake has been decided upon. Detailed information on the lake, its drainage basin, the problems involved, the actions proposed, rejected alternative measures, relationship to other programs, an analysis of current baseline data and proposed monitoring programs has to be included in the application.

On December 28, 1977 President Carter signed into law the Clean Water Act of 1977 (P.L. 95-217) which amends many of the provisions of the Federal Water Pollution Control Act. The new act emphasizes the importance of controlling toxic pollutants, and includes a long-range funding authorization for the municipal sewage treatment construction grants program. The exact amount of authorized funds which will be available depends upon congressional approval of pending appropriation legislation. Under the current allotment formula, Massachusetts will receive 2.95 percent of all construction grant funds appropriated.

Other relevant provisions include a requirement that 201 grant applicants study and evaluate the use of innovative and alternative wastewater treatment processes (the federal share for such treatment processes may be increased to 85 percent), and that the applicant has analyzed the potential recreation and open space opportunities in the planning of the proposed treatment works. Privately owned treatment works serving one or more principal residences or small commercial establishments which currently exist and are inhabited may be eligible for 201 funding if a public body applies for the grant and can insure that they are properly operated and maintained. For grants for treatment works costing 2 million or less for communities with a population of 25,000 or less the step 2 and 3 grants may be combined into one grant. In determining the amount of reserve capacity eligible for a 201 grant the administrator shall take into account the projected population and may refer to the 208 areawide plan for such projections. A user charge system using dedicated add valorem taxes may be allowed where such a system is presently in use and results in the distribution of operation and maintenance costs to each user class in proportion to the contribution to the total cost of operation and maintenance of such works. Such a system can only be used for residential users and certain small non-residential users. Any industrial user with a flow of 25,000/gpd or less, if such flow does not introduce incompatible pollutants into the treatment process, may be exempted from the requirement of industrial cost recovery. In addition, the Governor of a non-rural state, may request that four percent of the construction grant funds allotted to the state be set aside and available only for alternatives to conventional sewage treatment works for municipalities with a population of 3,500 or less or for highly dispersed sections of larger municipalities. Treatment works for control of pollutant discharges from separate storm sewer systems are ineligible for grant assistance. The determination of the priority to be given is to be made by the State.

Section 208 is amended by the Clean Water Act of 1977 to provide assistance to states in the development of a "best management practices program" to control the discharge or other placement of dredged or fill material into the navigable water. It also provides funds to the Secretary of Agriculture to enter into contracts with the owners of rural land to institute "best management practices" to control non-point source pollution from those lands.

The act requires industry to follow best management practices when storing and utilizing toxic materials on site. Rigid pretreatment standards will be

applied to industrial discharges to municipal systems to prevent sludge contamination. New deadlines call for industry to control conventional pollutants (i.e. suspended solids, BOD) by July 1, 1984. The degree of control will be an upgrading of the 1977 "best practicable controls". Non conventional pollutants, which include non-toxic organic, chemical or thermal pollution must be controlled by July 1, 1987. Toxic pollutants must be controlled by July 1, 1984. These toxics include those pollutants currently on EPA's toxics list and additions as well as deletions are provided for. Deadlines for industrial compliance with best practicable control technology has been extended from July 1, 1977 to April 1, 1979 if the discharger has proceeded in good faith toward meeting the deadlines and if treatment facilities are under construction. Compliance deadlines for industrial discharges waiting to tie into an incomplete municipal treatment facility are extended to the date the municipal facility is completed or July 1, 1983, whichever comes first.

Under the new act, EPA is authorized to extend to July 1, 1983, on a case by case basis, municipal compliance with secondary treatment standards. If innovative wastewater treatment processes are to be used this extension may be granted to July 1, 1983. An exemption from secondary treatment may be granted to municipalities that can prove that deep ocean discharges of primary treated sewage would not endanger fish populations or water quality standards.

2. Federal Government - Corps of Engineers - Department of the Army. Under section 404 of the FWPCA the Secretary of the Army has the authority to regulate the discharge of dredged or fill material into the waters of the United States through the issuance of permits. Under this program the Corps has asserted jurisdiction over fresh water wetlands adjacent or contiguous to other navigable waters and any other waters necessary to protect water quality. In Massachusetts this jurisdiction is similar to the jurisdiction asserted by DEQE and local conservation commissions over wetlands.

The Clean Water Act of 1977 amended section 404 of the FWPCA to allow the Secretary to issue general permits in a State, regional or nationwide basis for certain categories of activities and exempts certain farming, silvaculture and ranching activities and maintenance activity from the permit requirements. Moreover, any state desiring to administer its own individual and general permit program may request such designation from the EPA Administrator.

The Corps of Engineers, EPA, National Oceanic and Atmospheric Administration (NOAA), Coast Guard, and other state and federal agencies are involved in a joint effort -- Interagency Coordination Committee for Ocean Dumping -- to monitor impacts of ocean dumping (including treatment plant discharges) requested under authority of the FWPCA, the Coastal Zone Management Act of 1972, or the Marine Protection, Research and Sanctuaries Act of 1972.

In May of 1972, the U.S. Army Corps of Engineers New England Division announced its flood control program for the upper two-thirds of the Charles River Watershed. This program consists of acquiring 17 of the most critical wetland areas in the watershed in order to preserve them in their natural state so that they can effectively store storm waters and thereby provide an effective non-structural flood management mechanism. The acquisition of these areas was authorized by the Water Resources Development Act of 1974 (P.L. 93-251) which also requires that all future flood control projects consider non-structural alternatives and offers equal federal cost-sharing for

these non-structural alternatives. It is expected to take about three years to acquire the approximately 8500 acres of NVS wetlands (3 of the wetland areas are on the main stem of the Charles, while the other 14 are in the tributary watersheds). The areas will be acquired according to priorities which have been set considering the area location, volume of storage capacity and degree of development threat.

3. Federal Government - The Soil Conservation Service. The Soil Conservation Service was established in the U.S. Department of Agriculture by Congress in 1935 to plan and carry out a national program to conserve and develop the nation's soil and water resources through conservation districts (PL 74-46). Soil Conservation Service personnel provide planning and direct technical assistance to soil and water conservation districts. Much of the information available from the Soil Conservation Service (soil surveys, etc.) has been used extensively in the development of 208 plans. In addition, technical assistance is available to land users in determining alternative land uses and non-point source treatment needs and in developing a conservation plan reflecting these land use and treatment decisions. Technical assistance is also available to cooperating land users in installing planned conservation practices including necessary site investigations, design and specification, construction plans and layout practices. Supporting this assistance are technical guides and other technical materials which include: (1) an array of resource information; (2) soil and site information with interpretations for various uses; (3) resource management to improve, maintain and reduce pollution; (4) practice standards and specifications; and (5) cost-return and other economic information.

Soil Conservation Service programs of particular interest in terms of water quality management include:

- The Natural Resources Planning Program which assists communities in developing an inventory of present natural resources (done as part of the Natural Resource Inventory Programs) evaluating those resources against established guidelines, determining the consequences of proposed actions on the natural resource base, and planning the acceptable course of action to maintain and improve the community's environmental quality.
- Soil surveys and special soil reports for communities which provide detailed soils information for communities and can indicate appropriate uses on such soils.
- Town Comprehensive Plans for the wise use and conservation of a community's natural resources.
- Massachusetts Water Resources Study prepared in conjunction with the Massachusetts Water Resources Commission which identifies potential and existing upstream reservoir sites, determines present land use and projects future land use, identifies and evaluates existing wetlands in selected areas and delineates selected floodplains with alternatives for reducing flood damages. Such a study was recently completed for the Charles River Basin.

- Flood Hazard analyses which define existing floodplains and provide data needed by units of government to develop a floodplain management program that will effectively reduce flood losses.
- P.L. 566 Watershed Program which can provide federal technical and financial assistance in identifying and solving land and water problems such as flood prevention, water supply, protection of fish and wildlife and prevention of erosion and sedimentation.
- Resource Conservation and Development Areas which are locally initiated, sponsored and directed programs, planned and carried out in areas where there is a need to accelerate the conservation and development of natural resources, improve the general level of economic activity and enhance the environmental and standard of living.

As noted in a previous subsection, The Clean Water Act of 1977 amended section 208 of the FWPCA to authorize the Secretary of Agriculture, acting through the Soil Conservation Service, to enter into contracts with the owners of rural land to institute "best management practices" to control nonpoint source pollution from those lands. This program cannot be used to authorize or finance projects that would otherwise be eligible for assistance under the P.L. 566 Watershed Program.

4. Federal Government - The Department of Housing and Urban Development. The Department of Housing and Urban Development (HUD) administers a number of programs that are important in terms of water quality management.

The 701 Comprehensive Planning Assistance Program⁶² established pursuant to section 701(c) of the Housing Act of 1954 has provided substantial planning monies in the past 20 years. While the program is not primarily concerned with the environment, it ties into 208 planning in a number of ways.

The Housing and Community Development Act of 1974 provides that 701 plans must include a land use element. After August 22, 1977 no grant can be given unless HUD is satisfied that the plan includes an adequate land use element. This element must include studies and procedures necessary for effectively guiding decisions with a significant impact on where growth will or will not take place. In addition, planning activities must include an environmental assessment that indicates the impacts of the proposed plan. The environmental conclusions must be reflected in the land use plan.

The 701 plans must also provide for the coordination of local, areawide and state land use policies, and achieve consistency between the land use plan and capital improvement programs and transportation open space and public utility plans. Additionally 701 plans must be consistent with completed 208 plans. To a large extent, the development of 701 land use plans will rely on completed 208 work. This will greatly aid in achieving consistency. Care must also be taken that the policy choices required by each program do not conflict.

Under the Flood Disaster Protection Act of 1973 (P.L. 93-234), communities with areas designated as subject to serious flood hazards must adopt adequate land use control measures in order to be eligible for federally subsidized

flood insurance. After a community has joined the program and HUD issues the final "rate" maps, the community may appeal the boundaries to HUD, but must ultimately join the "regular" program and adopt land use regulations to minimize flooding and protect the 100-year "floodway". Generally, HUD will approve regulation of land use which raises the level of the dwelling above the 100-year flood level or floodproofs the lower floors. Communities may, but need not go further and adopt more extensive local floodplain zoning. In most cases communities should adopt procedures to regulate all new development or construction; to assure that new or replacement water supply and/or sewage systems are designed and located to avoid impairment or contamination during flooding; and to prohibit fill or encroachments in a floodway that would increase the water elevation of the 100-year flood more than one foot. Restrictions should also limit flood related erosion.

Although the flood insurance program is not directly concerned with water quality, its requirements will be compatible with 208 plans in many ways. Restrictions on development, for example, may serve both goals by providing a buffer area around streams. The regulation of impermeable surfaces could also serve dual objectives.

The flood insurance program calls for communities to require that all public utilities, including sewer and water systems are elevated, located and constructed to minimize or eliminate flood damage, to require that water supply systems and/or sanitary sewerage systems be designed to minimize or eliminate infiltration of flood water into the system and discharges from the systems into the flood waters, and to require that waste disposal systems be located so as to avoid impairment of them or contamination from them during flooding.

In adopting land use controls under the Flood Insurance Program, communities are required to consider state and local water pollution control requirements and the coordination of land use, sewer and drainage regulations both within the community and in neighboring areas.

The Housing and Community Development Act of 1977 (P.L. 95-128) removed the sanctions provided under the Flood Disaster Protection Act of 1973 that prohibited federally supervised, approved, regulated or insured lending institutions from making, increasing, extending or renewing any loan secured by real estate in a flood hazard area if the community was not participating in the flood insurance program.

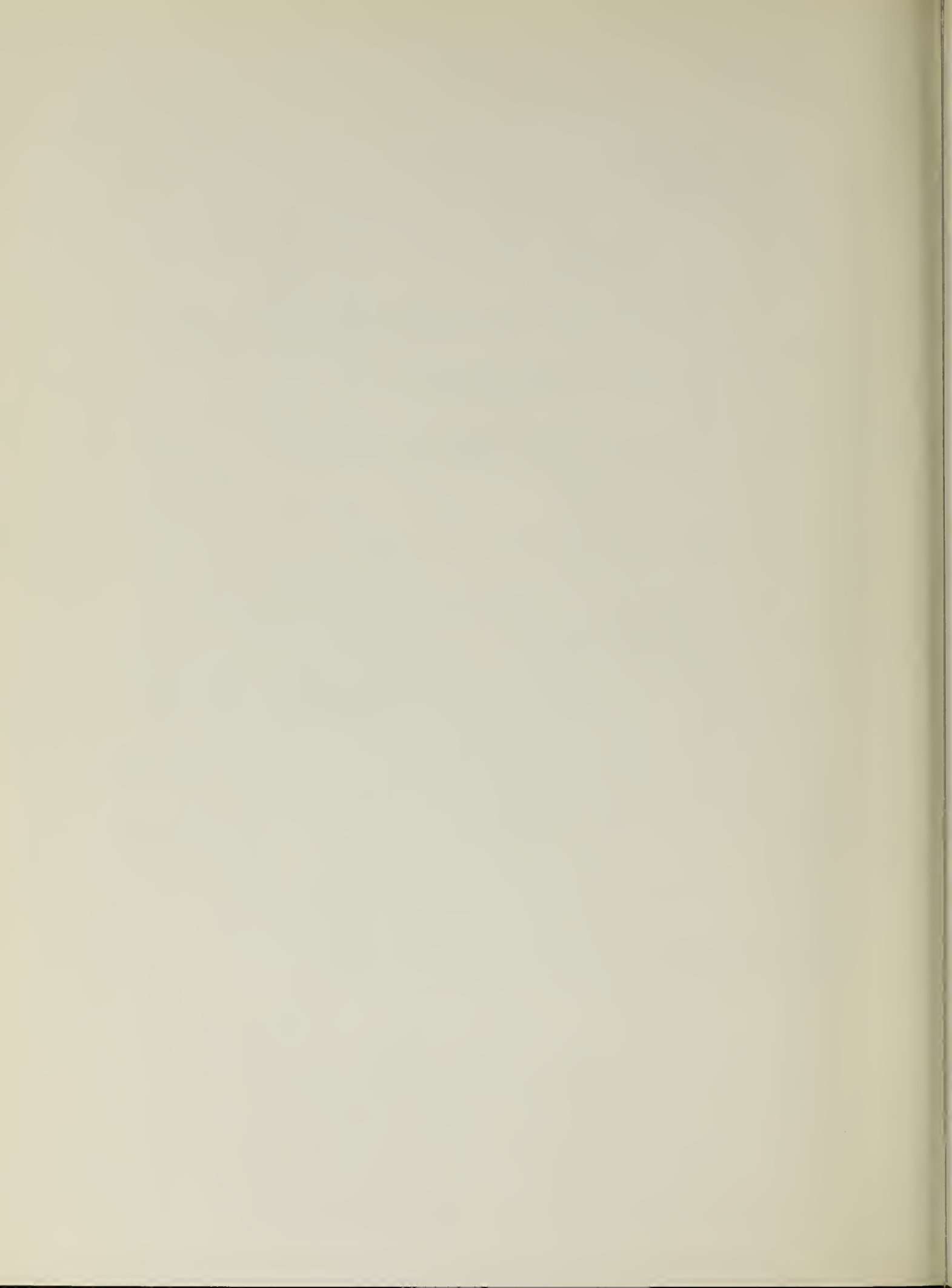
Under the Housing and Community Development Act of 1977 community development block grants may be available to fund some of water quality-related capital improvements within the 208 area. Although treatment works, interceptors and outfalls would not be eligible, other types of projects, including collection systems could be if basic eligibility requirements are met. There are a number of different grant programs within the Act, each with different eligibility criteria including the basic block grant program, the discretionary grant program, the small cities program and the Urban Development Action Grant (UDAG) program. The new law adds, as a specific block grant objective, the alleviation of physical and economic distress through the stimulation of private investment and community revitalization in areas with population outmigration or a stagnating or declining tax base.

While there are a number of other federal agencies and programs that relate to water quality management, they are omitted from the discussion either because their involvement in the water quality management system will be limited and sporadic (such as the Farmers Home Administration and the Federal Highway Administration), or because their programs work primarily through state agencies previously described (such as the Bureau of Outdoor Recreation (BOR), within the U.S. Department of Interior, or the National Oceanic and Atmospheric Administration (NOAA) within the U.S. Department of Commerce).

FOOTNOTES

- 1) G.L. C. 41 S.S. 73, 81A, 81B.
- 2) G.L. C. 41 S. 81A.
- 3) G.L. C. 41 S.S. 81 A-J, M.C. 40A S.S. 1,5.
- 4) G.L. C. 40A S. 7.
- 5) G.L. C. 40A S. 12.
- 6) G.L. C. 40A S. 14.
- 7) G.L. C. 21A S. 13; C. 111 S. 127A.
- 8) G.L. C. 111 S. 127.
- 9) G.L. C. 111 S. 150A.
- 10) G.L. C. 111 S. 122; see Stone v. Heath 179 Mass. 385, 69 NE 975.
- 11) G.L. C. 111 S. 122A.
- 12) G.L. C. 111 S. 143.
- 13) G.L. C. 111 S. 31.
- 14) Ibid.
- 15) G.L. C. 40 S. 8C.
- 16) G.L. C. 131, S. 40.
- 17) G.L. C. 214, S. 7A.
- 18) G.L. C. 41, S.S. 69C-F.
- 19) G.L. C. 102, S.S. 19-26.
- 20) G.L. C. 41, S. 69A, C. 40 S. 39A.
- 21) G.L. C. 41, S. 69B.
- 22) G.L. C. 40, S. 39B.
- 23) G.L. C. 41, S.S. 63, 65.
- 24) G.L. C. 41, S.S. 21, 69.
- 25) G.L. C. 40D, S. 2.
- 26) G.L. C. 40D, S. 3.
- 27) For a step-by-step guide to implementing the IDRB program and applying for IDRB financing, see Massachusetts Department of Commerce and Development, "Massachusetts Industrial Revenue Bond Financing Plan".
 For a good discussion of the kinds of legal documents used to assure exemption from tax for the bondholder and other tax benefits to the company, see Early, "Financing Pollution Control Facilities through Industrial Development Bonds:. 27 Tax Lawyer 85, 98-105 (1975).
 It should be noted that MGLA C.40D, S. 23 authorizes a municipality, through its IDFA to accept state or federal grants or loans for pollution control facilities or to be financed by IDRB's.
- 28) Peterson and Galper, "Tax Exempt Financing of Private Industry's Pollution Control Investment", 23 Public Policy No. 1, at 81 (Winter, 1975) cited in Surrey, et al, Federal Income Taxation, Volume I, 1975 Supplement, at 115.
- 29) G.L. C. 40D, S. 21.
- 30) G.L. C. 40B, S.S. 24-29.
- 31) G.L. C. 21, S.S. 28-36.
- 32) Town of Hadley v. Town of Amherst, (1977) Mass. Adv. Sh 341, 345.
- 33) G.L. C. 21, S.S. 18-25.
- 34) C. 704 of the Acts of 1969.
- 35) C. 806 of the Acts of 1974.
- 36) G.L. C. 21A, S. 3.
- 37) G.L. C. 21A, S. 4.
- 38) G.L. C. 21A, S. 5.
- 39) G.L. C. 30 S. S. 61 and 62.

- 40) G.L. C. 184 S. 32.
- 41) G.L. C. 132A S. 11.
- 42) 16 USC S 4601-4 to 11.
- 43) G.L. C.21 S.8 et seq.
- 44) G.L. C.21 S. 57.
- 45) G.L. C.21 S. 58.
- 46) G.L. C. 21 S. 27.
- 47) G.L. C. 21 S. 28(a).
- 48) G.L. C. 21, S. 26A.
- 49) see "Final Report on a Conceptual Design for User Charge and Industrial Cost Recovery Systems", May, 1977, prepared for the MDC by Arthur Young and Company.
- 50) G.L. C. 92, S. 5B, as amended.
- 51) see C.K. C. 92 § 2 and 8A; Chapter 705, section 12 of the Acts of 1945;
see also V Op. Atty. Gen. 559; 1941 Op. Atty. Gen. 37.
- 52) Chapter 705, section 12 of the Acts of 1945.
- 53) G.L. C. 92, S. 8A.
- 54) G.L. C. 92, S. 3.
- 55) G.L. C. 92, S. 6A.
- 56) EMMA Study, Vol. 12, Part I, p. IV-16.
- 57) G.L. C. 16, S. 19.
- 58) G.L. C. 16 S. 21.
- 59) G.L. C. 16 S.S. 21-23.
- 60) pursuant to G.L. C. 130 S. 105 (Coastal Wetlands) and to C. 131 S. 40A (Inland Wetlands).
- 61) 42 USC 7401 et seq.
- 62) most of the discussion of this program is taken from "Legal and Institutional Approaches to Water Quality Management Planning and Implementation" U.S. EPA, March 1977, pp. XVII-XVIII.



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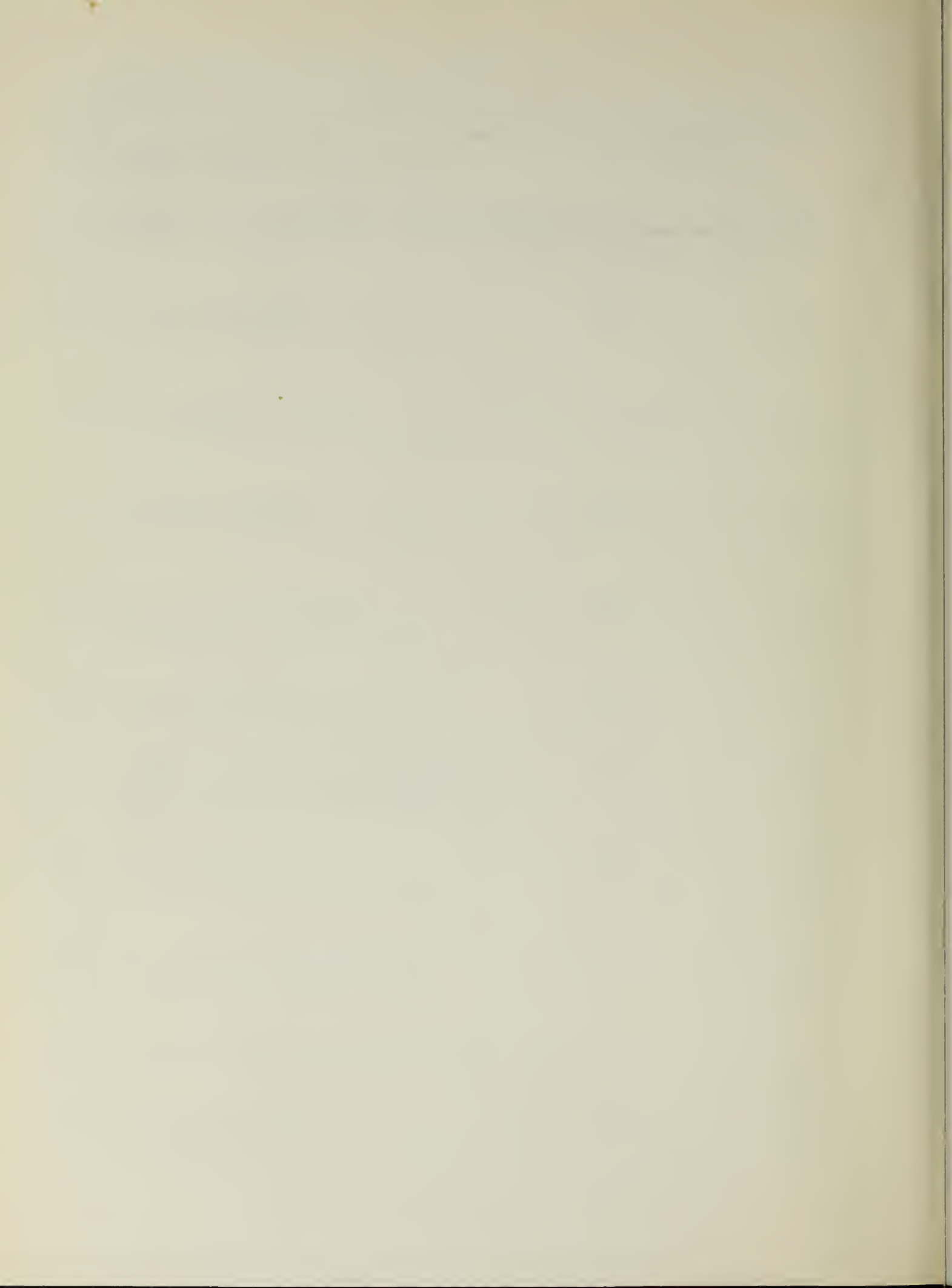
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E	EPA
G	General
L	Local Government
O	No External Distr.
P	Public
S	DEQE
T	Technical Subcommittee
V	Various Individuals
W	DHPC
X	Executive Committee
Z	Full Council

